UNIT: 3

Dashrath Nandan

★ User Interface Design

User Interface design is also known as user interface engineering. It focus on visual experience of digital product.

➤ User interface are the points of interaction between the user and developer. They come in 3 diff. types of formats:

i) Graphical User Interface (GUIs): The user can interact with visual representations on the digital control panels.

ii) Gesture-Based Interface: User can interact with 3D design spaces by moving their bodies.

iii) Voice-Controlled Interfaces (VUIs): User can interact with help of voice.

✳ How to make good UI / Key consideration while designing UI:

- Keep the interface simple.
- Be consistent and use common UI elements.
- Placement of item.
- Uses of right color and typography.
- Quick Responses.

✳ Interface Components:-

i) Input Control: Input Control involves buttons, toggles, checkbox, Radio,

ii) Navigational Components: It contains Sliders, tags, Search fields, icon

iii) Informational Components: Contains tooltips, icon, progressbar, Notification

iv) Containers: Container include accordion.

★ UI Design Process

1. Functionality Requirements Gathering.
2. User and Task analysis.
3. Information Architecture.
4. Prototyping
5. Usability Inspection
6. Usability Testing
7. GUI design
8. Software Maintenance

* UI Design Requirements:

The following are the seven dialogue principles —

i) Suitability of the Task.
ii) Self-Descriptiveness.
iii) Controllability.
iv) Conformity with User Experience.
v) Error Tolerance.
vi) Suitability for Individualization.
vii) Suitable for Learning.

* The 7 Presentation characteristics are —

1) Clarity 2) Discriminability 3) Conciseness
4) Detectability 5) Legibility 6) Consistency
7) Comprehensibility :- Meaning Straightforward, recognizable.

* Principles of UI Design:

- Clarity is Job
- Keep User in Control
- Conserve attention at all cost
- Provide a natural next step.
- Help People Inline
- Direct Manipulation is Best.
- Great Design is Invisible.
- Progressive Disclosure.
- Strong Visual Hierachies
- Keep Secondary Action Secondary.

* Mistakes to Avoid in UI Design:

- Do not Implement a user-centred design.
- Excessive use of dynamic effect.
- Preparing so much in advance.
- Not learning more about the target audience.

* Essential Tools for UI Design:

1) Sketch 2) Adobe XD 3) Invision Studios
4) UXPin 5) Framer X 6) Marvel
7) Zeplin 8) Original Studio

1) Sketch : Sketch is a vector graphics editior used for drawing, wireframing, prototyping and design. It is compatible with MacOS.
Key features : • Intuitive vector editing tools for flexible design.
• Infinite design canvas, Coos platform tools.

2) Adobe XD : It is fast, it's powerful, Vector based drag-and-drop, 3D Transforms, Powerful animation functionality.

3) UXPin : It is a popular UX and UI tool, used by both new and Seasoned designers. Built in libraries, Embedded user flow capabilities, Built-in contrast checker.

★ Effective Use of Screen Real Estate

Screen real estate in e-learning refers to the physical space available on a computer. It refers to the amount of space that is available on a screen.

- Six principles to be considered are:-

i) Use white space, but not too much.
ii) Narrow the margins.
iii) Use graphics and figures carefully.
iv) Use audio functions.
v) Place closed captioning strategically.
vi) Use a responsive e-larning design.

✱ Key Considerations and Strategies for Optimizing Screen Real estate:

i) Responsive Design
ii) Clear Navigation
iii) Hierarchy of Information
iv) Multimedia Integration
v) Consistent Layout
vi) Whitespace
vii) Font and Text Formatting
viii) Interactive Elements

Conclusion: To use screen real estate effectively, we must think like a user. What do they want to see on the screen? How they will interpret the info?, etc.

- Some other strategies for Optimizing Screen in Mobile-app-develop:-

ix) Push Notification
x) Device Specific Consideration
xi) Chunked Content
xii) Consistent UI Elements
xiii) Offline Access.

➤ Mobile application is a software application developed specially for use on small, wireless computing devices, such as smartphones and tablets rather than desktop or laptop.

- Mobile apps are majorly developed for 3 OS / Platforms:

i) Android ii) iOS iii) Windows

★ Mobile application development is a process of creating software applications that runs on a mobile device.

* There are 4 ways / approach to develop mobile app:

1) Native App development: These types of apps normally run in native device, that is, it run only in the OS that it is specially designed for it.

Advantage	Disadvantage
• The performance is very high.	• Development speed is slow.
• Access to all features and APIs.	• Doesn't support open-source.

2.) Hybrid mobile Application:

3.) Cross-Platform Application: These are frameworks that allows developing total native application which have access to all native features of IOS and Android but with same code base.

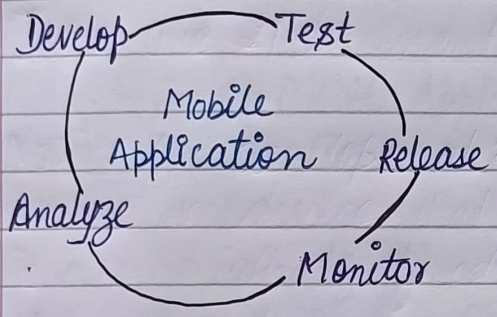
Advantage	Disadvantage
• App development speed is fast.	• Slow code performance.
• Maintenance cost is low.	• Limited User Experience.

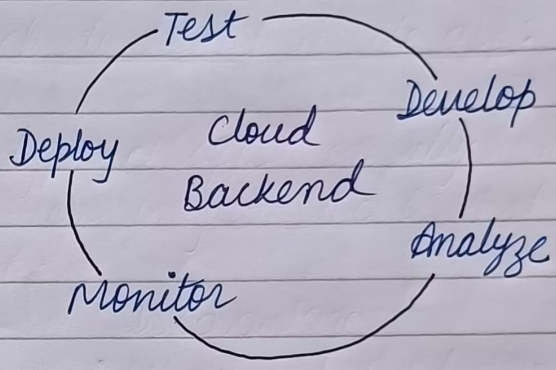
4.) Progressive Web Application: Progressive web apps are essentially a website which runs locally on your

device. The technologies used are Microsoft Blazor, React, Angular JS, Native Script and normally used for web development process.

Advantages	Disadvantages
• Developement speed is fast.	• Doesn't have all the features.
• No installation required.	• The community is not wide spread.

* The Mobile Application Development Lifecycle





➤ How Front-end 'Talks' to the Back-end?

The mobile front-end obtain data from the back-end via a variety of service calls such as APIs. In some cases, these APIs are owned and operated by the same entity developing the mobile apps. And, In some others cases, third party owned and operates.

* Pros of Mobile Application	Cons.
i) Offline Access.	i) Support & Maintenance.
ii) Extensive capabilities.	ii) Cost.
iii) Personalization.	iii) Compatibility.
iv) Convenience.	iv) Use of User's resource.
v) User experience.	
vi) Speed Performance.	

☆ Websites:

Websites are collection of web pages that are linked with each other where the web pages share the Single domain name. It is published on a web server and publicly accessible.

Pros of Website	Cons.
i) Compatibility	i) User Experience
ii) Cost-effectiveness.	ii) No offline access.
iii) Broader Reach.	iii) Speed related issues.
iv) Update and Maintenance.	

* Advantages of Mobile Application over Websites →

i) Mobile applications are faster.
ii) Offline access.
iii) Better Personalization.
iv) Use of Mobile Device Features.

* Web Development refers to the process of creating websites and web applic^n that are accessible through web browsers. It is further divided into 3 categories :-

i) Front-End Web Development : Designing of web pages.
ii) Back-End Web Development : Dealing with database and Server-side programming.
iii) Full Stack Web Development : Combination of Front-End and Back-End.

Basis of Comparision	Android Developer	Web Developer
1) Scope of Development	Primary scope is centered around android app development & Customization	Primary scope is centered around websites & their maintenance.
2) Platform	Specific platform is needed.	Web browser to run the app.
3) Programming Language	C, C++, Java, Kotlin, Python, etc.	HTML, CSS, and Javascript.
4) D.B Knowledge	Needed to store app data.	Needed to store website data.
5)	Little difficult to learn.	Little easier to learn.
6) Example	Whatsapp, Facebook, Flipkart. Higher Speed and Performance.	Amazon, Yahoo, GFG, etc. Cost-efficient in its development.

6 Factors to consider while choosing web app Vs mobile app:

1) Target Audience
2) Functionality and UX.
3) Development and launch time.
4) Organic reach and ease of discoverabilty.
5) Privacy Concerns
6) Budget.

Adaptive Web Design

Adaptive web design is especially developed to adjust to size of browser or screen. Different website layout are created to fit best to specific screen size of diff. devices.

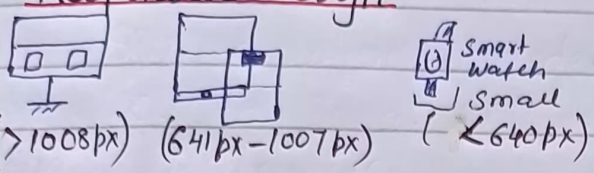
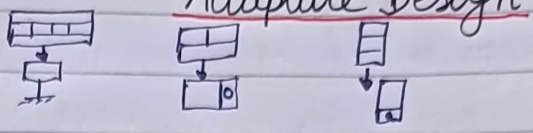
Advantages:

- Target for Each User
- Increase Load Time
- Reusable Existing Website.
- Advertising Monetization.

Disadvantages

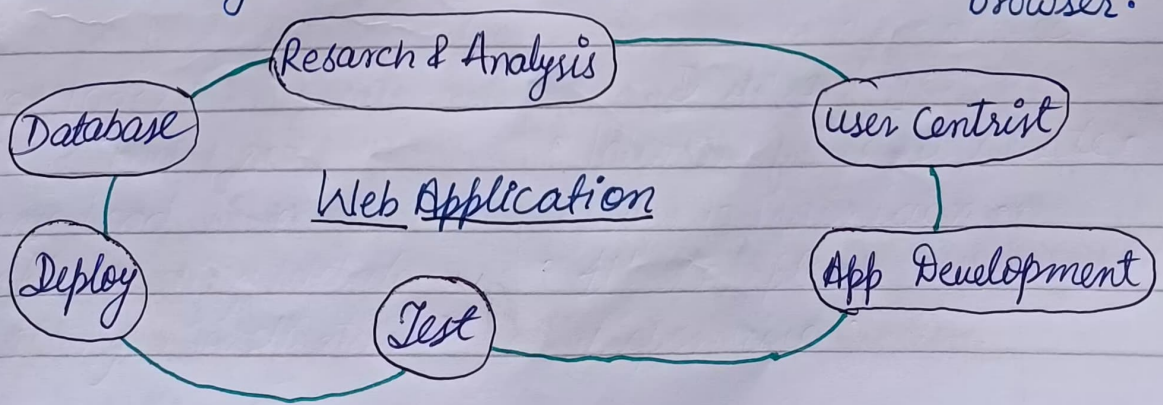
- Labor Intensive to create.
- Harder to Maintain.
- It's complex.
- Expensive.

★ **Responsive Design**: In this design web designers design the user interface of a website in such a manner that whatever device you are using you can comfortably access.

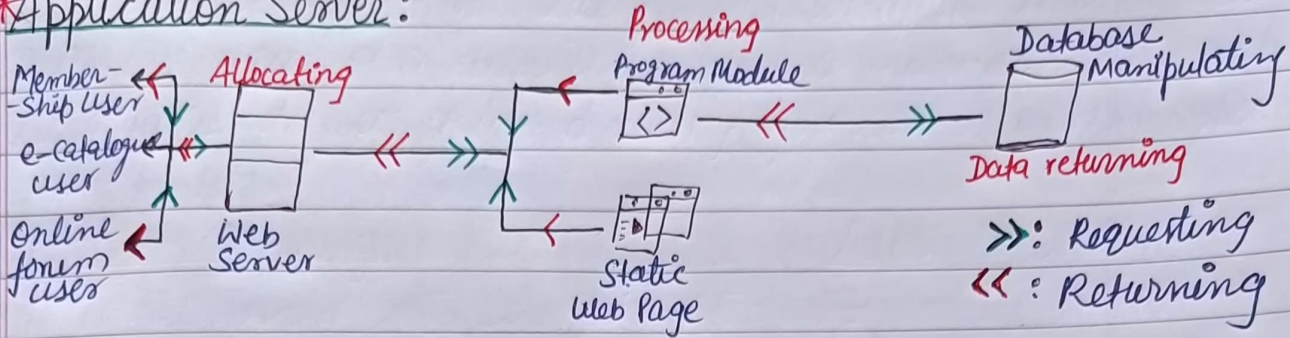
Responsive Design	Adaptive Design
	
• It adjust Content and width according to the device.	• Acc. to device, it loads the content of web page that already designed.
• Designers have to work less.	• Designer have to work more.
• It works well for larger sites.	• It works well for smaller sites.
• Responsive design is smooth.	• It snaps into place since the website is serving.
• Search Engine Friendly, Flexibility, Easier Implement?	• Best user experience, Outperforms on speed test.
• More Coding	• Website is complex
• Slack, Github, Shopify	• Apple, Amazon.

★ **Web Application**

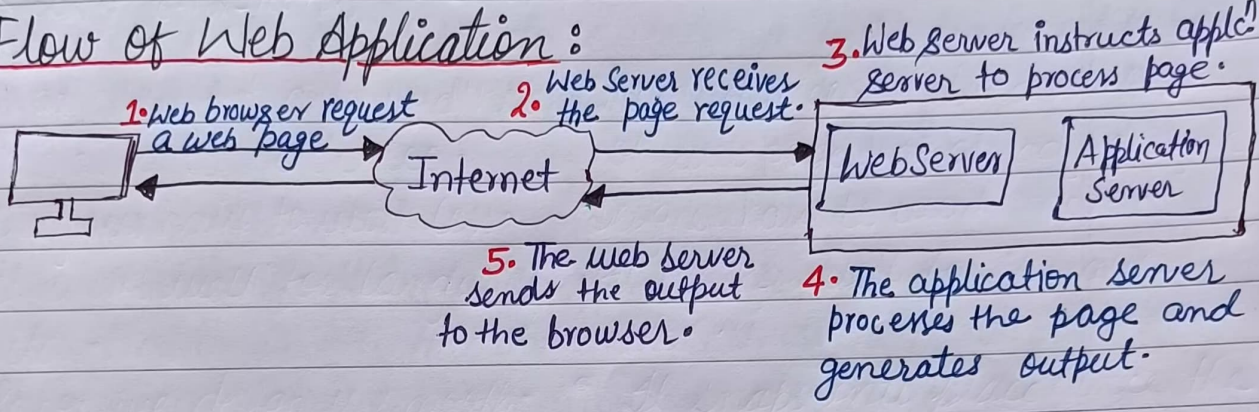
A web-application is an application program that is usually stored on a remote server, and users can access it through the use of Software known as web-browser.



*Application Server:



*Flow of Web Application:



★ Dedicated mobile website Web Apps with HTML5.

- A dedicated mobile site is a separate version of your website designed exclusively for mobile device.
- The most common implementation is for the mobile sites to add a prefix or suffix to the main domain (eg. exmple.com becomes m.exmple.com) and user automatically redirected to the mobile site if they access the website via a mobile device.

Advantages:

i) Tailored Content: Separate mobile and desktop content.
ii) Speed: Optimize and streamline the site for mobile User Experience
iii) Quick development: If you already have an existing website, it is easier to build and launch.

Disadvantages:

i) Multiple domain/URL
ii) Require redirection
iii) Extra work.

* An HTML 5 mobile app is a web application developed with version 5 of Hypertext Markup Language, a web standard designed for handheld device like smartphones and tablets.

➤ HTML 5 : A powerful tool for Mobile Application Development.

- It is the main domain for most cross-platform application development tools such as Apache Cordova, Rhodes, etc.
- It makes it effortless to create a fully featured web app that can be updated remotely with new functionality.

Key features:

i) Offline support: It includes applic^n cache, Web storage and indexed database APIs that stores HTML, JS, CSS resources, locally.

ii) Multimedia: HTML5 has advanced capabilities for streaming video and audio data, handling graphics & Animation.

```
<video src="myvideo.mp4" controls/>
<video poster="myvideo.jpg" controls/>
<source src="Myvideo.M4v" type="video/mp4"/>
<source src="myvideo.ogg" type="video/ogg"/>
<embed src="/to/my/video/player"></embed>
</video>
```

iii) Geolocation API: It helps user to share their location with the website.

iv) Canvas: It is used to draw graphics on the web page.

```
Canvas = document.getElementById("mycanvas");
```

Set dimension ⇒

```
canvas.width = window.InnerWidth;
Canvas.height = Window.innerHeight;
```

Frameworks for application development:

i) JQuery Mobile: This is a unified UI system across all popular mobile device platforms and is built on jQuery and jQuery UI.

ii) JQT (JQTouch): This is a JQuery plugin, which consist of animation, automatic navigation, etc.

iii) Sencha Touch: This is used to create mobile apps for several platform including iOS, BlackBerry and Android.

iv) SproutCore: This is an original JavaScript MVC library.

* Android History, features, Versions, Best Android alternatives,

→ iOS, GrapheneOS, KaiOS, Sailfish OS, Ubuntu Touch, etc.

[Self study / LMS, (Lecture 3.2.5) (PPt)]

★ Android Fundamentals:

Android is an OS that is built basically for Mobile phones.

1. Android Programming Language, Java or C++ or Kotlin and XML.
2. Android Components: Four major Components are:

a) Activities: It deals with the UI and User Interaction to the screen.

```
public class MainActivity extends Activity { // process }
```

b) Services: Services are the background action performed by the app.

```
public class MyServices extends Services { // Code for Services }
```

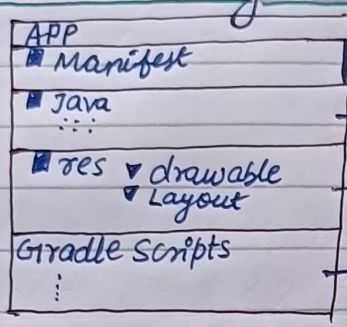
c) Broadcast Receivers: A Broadcast is used to respond to messages from other applications or from the system.

```
public class MyReceiver extends BroadcastReceiver {
    public void onReceive(context, intent) { }
```

d) Content Provider : It is used to transferring the data from one application to the others at the request of the other application.

```
public class MyContentProvider extends ContentProvider{ public void
onCreate (){}}
```

3) Structural Layout of Android Studio :



Manifest Folder : Manifest is an XML file that is the root of the project source set.

Java Folder : Java files that are required to perform the background task of app.

Resource Folder : Consist of various resources used.

Gradle Files : Gradle is an advanced toolkit, which is used to manage the build process, that allows defining the flexible custom build configuration

4) Activity Lifecycle :→ Unit 1 notes.

★ How to publish your Android App on Google Play Store:

Step 1: Make a developer Account.
2. After Step1, click on the CREATE APPLICATION button.
3. Store listing.
4. App release.
5. Content rating
6. Pricing & distribution
7. App content.
8. App release.

★ Create an Android project : Follow these Steps –

↳ Install Android Studio.
↳ On Android studio window, click Create New Project.

↳ If you already have a project, select File → New → New Project.
↳ In Template window, select Empty Activity and click Next.
↳ In Configure your project window, complete following –
Fill all details :– Name, Select Language, Select version, etc.
↳ Click Finish.
↳ After some time, Android Studio main window appears.

★ iOS : iPhone Operating System

➤ It is Apple's mobile operating system developed and distributed by Apple Inc. It is designed to run on Apple devices.
➤ The first version of Apple iOS was released on 29 July 2007.
➤ Apple iOS, Unix-like OS, is based on MacOS.
➤ Xcode is the IDE used by iOS (and OS x) developers.
➤ X code provides an interface to the compiler, editor, etc.

Version History

SN	Release Year	OS	Features
1.X Series	2003	MacOS 10.3+	It is based on project builder.
2.X series	2005	MacOS 10.4+	It included the Quartz Composer.
3.X Series	2007	macOS 10.5+	Includes DTrace debugging tool.
4.X Series	20	macOS 10.6.8+	integrated the Xcode editing tool & interface
5.X Series	2013	macOS 10.8+	added support for iOS 7 SDK.
⋮			
11.X Series	2019	macOS 10.14.4+	New features in Swift 5.1, framework.

• XCode Project: When we create new Xcode Project, It shows every information of the project that includes –
Bundle Identifier, App Version, Build Version, Signing Info, Deployment Info.,

* **Interface:** Apple iOS provides a user-friendly interface that uses multi-touch gestures like swipe, tap, pinch, etc, to facilitate the user interacting with the application. The user can trigger any event using switches, buttons and sliders.

* **IOS Architecture**
There are 4 abstraction layer with iOS –

COCOA TOUCH (Application Layer)
MEDIA LAYER
CORE SERVICES
CORE OS

1. **CORE OS:-** It provide framework interaction with external hardware and security. Eg: Core Bluetooth framework, hardware & security framework.

2. **CORE Services Layer:** It offers services for upper layers. Eg: Core Motion framework, foundation, Healthkit Framework.

3. **Media layer:** It offers necessary technologies for graphics, audio and video.

4. **Cocoa Touch layer:** It contains frameworks which are required for creating an application. Eg: Evenkit, Gamerkit, Mapkit, Pushkit framework.

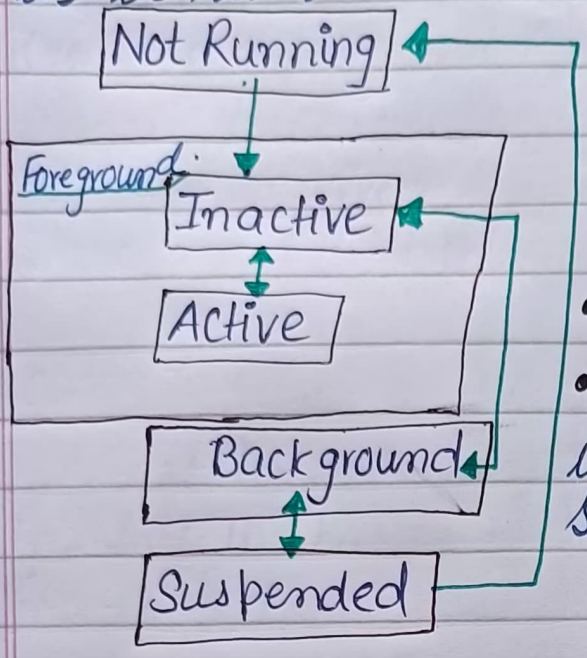
* **iOS Applications:**
Apple Pay, Home Screen, Notification center, Game Center, Bluetooth, Camera integration, Location Services, Maps.

* **Advantages**
  - More secure than other OS.
  - Excellent UI and fluid responsive.
  - Suits best for Business & Professionals.

Disadvantage
- More costly.
- less User Friendly.
- Battery performance is poor.

★ iOS app lifecycle :

Every iOS application passes through the following states as it runs –



- App is not running, when it is not yet launched or terminated by system.
- App is in an inactive state, when it is in the foreground but receiving events.
- Active, it is a normal mode for app.
- App transition into background state, when the user taps on the home screen while using applications.

✱ Features of iOS

i) Multitasking ii) Wi-Fi, Bluetooth and Cellular connectivity.
iii) Gesture recognition Support. iv) Push email
v) Background audio vi) Local Notification
vii) Task Completion viii) Fast App Switching.

★ iOS Project : Conventions, Structure, Project.

- Conventions –

Naming Conventions : First establishing a naming conventions for all things for file names, class names, project names, etc.

Coding Conventions : Choose your coding convention & Style.

- Structure –

Create a specific Workspace.
Create a Build Automation to scripting common tasks.
Create a AdHoc and AppStore Build Configuration.
Manage third-party-libraries with CocoaPods.
My folder Structure:- Application, Controllers, Library, Model, Resources, Vendors.

- Project – When an iOS project is created within xCode, the IDE creates a set of files that are ready to run. These files provides the basics of what is needed to get going with a new project.

Main.mm, AppDelegate.m: Receives msg from app object.
MainStoryBoard.storyboard: This is where UI is created.
Supporting files.

★ Debugging IOS App:

Modern-day IDEs provide a great deal of tooling that helps developers find issues in their code before it reaches production

- Developers use the iOS Simulator as their first way of finding issues. It is a great tool for testing apps quickly.
- The debugging tool within xCode are at the bottom of workspace- click View → Debug Area → Show Debug Area to make debugging tool visible.
- Local window, shows you list of all variables that are currently within scope of your current breakpoint.
- Breakpoints, can be set by clicking on "gutter".
- Output, it gives important info. about the execution of the app.

★ Objective-C

Objective-C is the primary programming language, used when writing software for OS X and iOS.

- It is a superset of C programming language and provides object-oriented capabilities and a dynamic runtime.
- It inherits syntax, primitive types, and flow control statements of C.

* Characteristics:

The class is defined in two different sections namely @interface and @implementation.

- Objects receives messages and often referred as receivers.
- Objects contain instance variable.

Language Support: Fully supports object-oriented programming, including Four Pillars of object-oriented development - Encapsulation, Data hiding, Inheritance, Polymorphism.

* Classes

The interface of Objective-C classes is defined in a header file for each interface.

```
@interface Dog: Animal{
    // instance variables
}
// method declarations
@end
```

* Methods

- Methods can be declared as either instance mthd or class methods.
- Instance methods are called by sending msg. directly to instance of class
- -(NSString) getNameOfAnimal.

* Operators

An operators is a symbol that tells the compiler to perform specific mathematical or logical manipulation

Eg:- Arithematic, Relational, Logical, Bitwise, Misc Operator (sizeof, &, *, ?:)

* Loops

It allows you to execute a stmt multiple times. Eg: while, for, dowhile, nested loops.

- Control Statements -
  - break Statement
  - Control Statement.

★ Windows Mobile 7 Development

Windows Mobile 7 development is done using the .NET framework. The .NET framework is a software framework created by Microsoft for use in creating Windows application.

Procedure:

- Getting Set Up: Download the development tool.
- Opening Visual Studio
- Creating Your Project
- Navigating the UI Editor:
- Creating Your Application's Layout:

```
<Grid x:Name="LayoutRoot Background="{StaticResource PhoneBack-
                                    -ground Brush}">
<Grid ColumnDefinitions>
<ColumnDefinition Width="*"/>
</Grid.ColumnDefinitions>
<Grid.RowDefinitions>
<RowDefinition Height="*"/>
</Grid.RowDefinition>
</Grid>
```

- Adding the Button:

```
<Button
  Grid.Column="0":
  Grid.Row="0"
  Content="Tap me"
  Horizontal Alignment="Strech"
  Vertical Alignment="Strech" />
```

- Adding Event Handling:

```
{ Button b = Sender as Button;
   int col = Grid.GetColumn(b);
   int row = Grid.GetRow(b);
if(col==row){ Grid.SetColumn (b, ++col %2); }
else{ Grid.SetRow(b, ++ %2); } }
```

* Build your first Windows Phone 7 app:

1. Downloading the tools : Visual Studio IDE, SDK, Code Sample.
2. Our first Windows Phone application.
3. Construction begins:
4. Modify the existing app name and page title.
5. Adjusting Layout and adding controls.
   - Create your application layout, add buttons, TextBox, etc.
6. Time to code: Do the required changes in XML.
   - Right-click on your project and select Add, then Class.
7. Ready for launch: Setting the target type to Windows Phone Emulator.

[Draw Diagram]

★ App Distribution:

App distribution is the process of releasing an app to a broad set of users in order to promote app engagement and usage.

* Mobile App Distribution Platform:- A mobile app distribution platform holds the collection of mobile apps in all categories.
Top platforms:- Amazone Appstore, Samsung Galaxy Apps, Google Play Store, Apple App Store, Firefox Marketplance, Microsoft Windows Store, Blackberry World.

* Building App Distribution Strategy:

1. Targetting multiple channels & platforms.
2. Avoid non-performing platforms.
3. Consistent channel optimization.
4. Determine niche app distribution channels.

* Top Mobile App Distribution channels for Businesses :

- App Stores/Recommendation Sites.
- Pre-Loads.
- Ad Networks : Helpful for directing people to specific target.
- Pay-Per-Installs
- App Giveaways
- Create a mobile web version of your App.