



National Vocational Certificate Level 5 for Mobile App, Web and Game Development



National Vocational Certificate Level 5 for Mobile App, Web and Game Development

“Full Stack Developer”



National Vocational and Technical Training Commission (NAVTTTC),

Government of Pakistan



National Vocational Certificate Level 5 for Mobile App, Web and Game Development



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National Vocational and Technical Training Commission (NAVTTTC) extends its gratitude and appreciation to representatives of business, industry, academia, government agencies, provincial TEVTAs, sector skill councils and trade associations who spared time and extended their expertise for the development of National Vocational Qualification for the trade of **Mobile App, Web and Game Development**. This work would not have been possible without the technical support of the above personnel.

NAVTTTC initiated development of CBT&A based qualifications for 200 traditional / hi-tech trades under the Prime **Minister's Hunarmand Pakistan Program**, focusing on Development & Standardization of 200 Technical & Vocational Education & Training (TVET) Qualifications. NAVTTTC efforts have received full support from the Ministry of Federal Education and Professional Training which highly facilitated progress under this initiative.

It may not be out of place to mention here that all the experts of Industry, Academia and TVET experts of TEVTAs, BTEs and PVTC work diligently for making this qualification worthy and error free for which all credit goes to them. However, NAVTTTC accepts the responsibility of all the errors and omissions still prevailing in the Qualification document.

It is also noteworthy that development of Skill Standards is a dynamic and ongoing process, and the developed skill standards needs periodic review and updating owing to the constant technological advancements, development in scientific knowledge, and growing experience of implementation at the grass root level as well as the demand of industry. NAVTTTC will ensure to keep the qualifications abreast with the changing demands of both national and international job markets.

Executive Director (NAVTTTC)



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Introduction

a. Definition/Description of Training Program Mobile App, Web and Game Development

The importance of modern gadgets in our everyday life and activities is undeniably unending. This is so because there is ongoing tremendous transformation in which mobile phones, laptops and other devices are no longer the ordinary device they used to be. They have become the colossal point of attention for individuals and businesses alike, courtesy of the various incredible features and opportunities that they offer. The cumulative progress of technology, the availability and access to high speed internet and the remarkable communicative interface in these devices results into a whole level of new and innovative experience.

Web designing is the computer field which deals with the creation of websites and web application. The person who deals with the creation of websites and web application is known as a web designer or web developer. The best part of being a web developer is that they are employed by almost every organization and they can even work independently as a freelancer.

Mobile phones and devices have become such a ubiquitous part of our everyday lives that it's difficult to imagine going through an entire day without one. This shift to ubiquity has been driven largely in part by the increasing scope of mobile application development. Over just the past few years an explosion in not just the scope but also the depth of utility of these devices has occurred which rivals, if not exceeds that seen in any other discrete class of technology.

Game Development is the art of creating games and describes the design, development and release of a game. It may involve concept generation, design, build, test and release. While you create a game, it is important to think about the game mechanics, rewards, player engagement and level design.



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b. Purpose of the Training Program

Being conscious of the emerging trends in the market, National Vocational & Technical Training Commission (NAVTTTC) has developed competency standards in consultation with the stakeholders including academia, researchers, industry, chambers and TEVTAs for 'Mobile App, Web & Game Development' under National Vocational Qualifications Framework (NVQF). The competency standards document has been designed in a way that trainees can develop skill in the ability to explore and analyze writing in technical, scholarly and professional contexts. They can consolidate their knowledge and skills through advanced practice in writing, editing, designing and producing texts for professional and technical purposes, with concrete application on industry sourced documents and projects.

c. Objectives of Training Program

The main objectives of the National Vocational Certificate Level 5 for Mobile App, Web and Game Development are as follows:

- Empower the youth with globally required employable skills.
- Produce competitive Web, Mobile App and Game Developers.
- Produce a skilled youth for Mobile App, Web & Game Development Industry.
- Improve the quality and effectiveness of the training and assessment for Mobile App, Web & Game Development Industry.

d. Competencies to be gained after completion of course

At the end of the course, the trainee has attained the following core competencies:

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- 1) Explore/Install gaming framework
- 2) Create New Project of gameplay



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- 3) Produce prototypes of gameplay ideas and features
- 4) Generate game scripts and storyboards
- 5) Animate characters and objects
- 6) Insert audio/video features of the game
- 7) Explore/Use X-Reality
- 8) Implement basic programming skills to apply server side architecture
- 9) Integrate database with server side programming language
- 10) Implement MVC framework to develop web application
- 11) Integrate views and partial views with MVC
- 12) Integrate template engine with MVC application
- 13) Prepare web views for smart devices
- 14) Build Logic through Programming
- 15) Install/configure android Studio
- 16) Build Mobile Application
- 17) Test, Debug and use support libraries
- 18) Build robust UI for greater UX (user Experience)
- 19) Program/use background applications
- 20) Save user data/Integrate android application with database
- 21) Manage version control system to store repositories on cloud side
- 22) Manage web and cloud Hosting
- 23) Configure web server on local environment



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- 24) Configure/Manage indigenous open source Control Panel for Webhosting like CWP (Server end)
- 25) Use Control panel to manage hosting (Client Account)
- 26) Deploy Mobile applications and Games on cloud
- 27) Gather/elicitate client requirement
- 28) Write program for client side (using JS, JQuery, Angular/VUE)
- 29) Program a server side (using PHP, ASP, Python, Node)
- 30) Program a Database (Using SQL, MySQL, SQLite, and PostgreSQL)
- 31) Perform Testing of Application
- 32) Manage Project
- 33) Develop entrepreneurial skills
- 34) Apply management and communication techniques
- 35) Create human resource management plan
- 36) Develop project management plan
- 37) Develop sales plan
- 38) Conduct research for customer needs and satisfaction
- 39) Manage finances
- 40) Identify and resolve problems

e. Possible job opportunities, available immediately and later in the future:

Possible Career Paths



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- Game Developer
- Back-end Web Developer
- Android Developer
- Software Configuration Manager
- Full Stack Developer

f. Trainee Entry Level

The entry requirement for **National Vocational Certificate Level 5 for Mobile App, Web and Game Development** is given below:

Title	Entry requirements
National Vocational Certificate Level 5 for Mobile App, Web and Game Development	National Vocational Certificate Level 4 for Mobile App, Web and Game Development

g. Minimum Qualification of Trainer/Instructor:

A. BSCS/BSSE/BSIT/equivalent qualification, having expertise in Web and Mobile Application

OR



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B. National Vocational Certificate Level 5 for Mobile App, Web and Game Development “Full Stack Developer” with at least 6 months experience in relevant trade

h. Recommended Trainer: Trainee Ratio

The recommended maximum trainer: trainee ratio for this program is 1 trainer for 25 trainees.

i. Medium of Instruction i.e. Language of Instruction:

Medium of instruction will be in Urdu / English / Local language

j. Duration of the course (Total time, Theory & Practical time):

The distribution of contact hours is given below:

Total	-	1210 hours
Theory	-	753 hours (62.23%)
Practical	-	457hours (37.77%)

k. Sequence of Modules

- 1) Explore/Install gaming framework
- 2) Create New Project of gameplay
- 3) Produce prototypes of gameplay ideas and features
- 4) Generate game scripts and storyboards
- 5) Animate characters and objects



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- 6) Insert audio/video features of the game
- 7) Explore/Use X-Reality
- 8) Implement basic programming skills to apply server side architecture
- 9) Integrate database with server side programming language
- 10) Implement MVC framework to develop web application
- 11) Integrate views and partial views with MVC
- 12) Integrate template engine with MVC application
- 13) Prepare web views for smart devices
- 14) Build Logic through Programming
- 15) Install/configure android Studio
- 16) Build Mobile Application
- 17) Test, Debug and use support libraries
- 18) Build robust UI for greater UX (user Experience)
- 19) Program/use background applications
- 20) Save user data/Integrate android application with database
- 21) Manage version control system to store repositories on cloud side
- 22) Manage web and cloud Hosting
- 23) Configure web server on local environment
- 24) Configure/Manage indigenous open source Control Panel for Webhosting like CWP (Server end)
- 25) Use Control panel to manage hosting (Client Account)
- 26) Deploy Mobile applications and Games on cloud



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- 27) Gather/elicitate client requirement
- 28) Write program for client side (using JS, JQuery, Angular/VUE)
- 29) Program a server side (using PHP, ASP, Python, Node)
- 30) Program a Database (Using SQL, MySQL, SQLite, and PostgreSQL)
- 31) Perform Testing of Application
- 32) Manage Project
- 33) Develop entrepreneurial skills
- 34) Apply management and communication techniques
- 35) Create human resource management plan
- 36) Develop project management plan
- 37) Develop sales plan
- 38) Conduct research for customer needs and satisfaction
- 39) Manage finances
- 40) Identify and resolve problems



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Summary Template - Overview of the Curriculum

Following is the structure of the course:

Level 5								
1	Explore/Install gaming framework	Game Developer	5	Technical	7	18	25	2.5
2	Create New Project of gameplay		5	Technical	12	24	36	3.6
3	Produce prototypes of gameplay ideas and features		5	Technical	12	24	36	3.6
4	Generate game scripts and storyboards		5	Technical	12	24	36	3.6
5	Animate characters and objects		5	Technical	9	30	39	3.9



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6	Insert audio/video features of the game		5	Technical	6	18	24	2.4
7	Explore/Use X-Reality		5	Technical	5	15	20	2
9	Implement basic programming skills to apply server side architecture	Back-end Web Developer	5	Technical	12	27	39	3.9
10	Integrate database with server side programming language		5	Technical	8	12	20	2
11	Implement MVC framework to develop web application		5	Technical	14	18	32	3.2
12	Integrate views and partial views with MVC		5	Technical	12	18	30	3
13	Integrate template engine with MVC application		5	Technical	12	18	30	3
14	Prepare web views for smart devices		5	Technical	12	18	30	3



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15	Build Logic through Programming	Android Developer	4	Technical	10	21	31	3.1
16	Install/configure android Studio		4	Technical	12	18	30	3
17	Build Mobile Application		4	Technical	12	24	36	3.6
18	Test, Debug and use support libraries		4	Technical	12	18	30	3
19	Build robust UI for greater UX (user Experience)		4	Technical	12	18	30	3
20	Program/use background applications		4	Technical	12	18	30	3
21	Save user data/Integrate android application with database		4	Technical	6	9	15	1.5
22	Manage version control system to store repositories on cloud side		5	Technical	12	18	30	3



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23	Manage web and cloud Hosting	Software Configuration Manager	5	Technical	12	18	30	3
24	Configure web server on local environment		5	Technical	6	9	15	1.5
25	Configure/Manage indigenous open source Control Panel for Webhosting like CWP (Server end)		5	Technical	16	24	40	4
26	Use Control panel to manage hosting (Client Account)		5	Technical	10	15	25	2.5
27	Deploy Mobile applications and Games on cloud		5	Technical	10	15	25	2.5
28	Gather/elicitate client requirement	Full Stack Developer	5	Technical	18	24	42	4.2
29	Write program for client side (using JS, JQuery, Angular/VUE)		5	Technical	18	24	42	4.2
30	Program a server side (using PHP, ASP, Python, Node)		5	Technical	18	24	42	4.2



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31	Program a Database (Using SQL, MySQL, SQLite, and PostgreSQL)		5	Technical	18	27	45	4.5
32	Perform Testing of Application		5	Technical	12	18	30	3
33	Manage Project		5	Technical	18	27	45	4.5
34	Develop entrepreneurial skills	Entrepreneurship	5	Generic	12	15	27	2.7
35	Apply management and communication techniques		5	Generic	8	15	23	2.3
36	Create human resource management plan		5	Generic	8	15	23	2.3
37	Develop project management plan		5	Generic	8	15	23	2.3
38	Develop sales plan		5	Generic	8	15	23	2.3



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39	Conduct research for customer needs and satisfaction		5	Generic	12	15	27	2.7
40	Manage finances		5	Generic	12	15	27	2.7
41	Identify and resolve problems		5	Generic	12	15	27	2.7
	Total				457	753	1210	121
	Percentage				37.77	62.23		

Proposed Course Duration: 12 Months

Estimated Contact Hours: 1210 Hours

Estimated Credit Hours: 121 Hours



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Game Developer

Module 0613-S&AD&A-1.Explore/Install Game development framework

Objective: After the completion of this module, the trainee will be able to will be to install gaming framework

Duration: 25 Hours Theory: 7 Hours Practice: 18 Hours Credit Hours: 2.5

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1. Explore game development framework	Trainee will be able to <ul style="list-style-type: none"> Explore Multiple platforms and Game Engines Explore primary features of game engines. Explore primary functionality of game engines. 	Knowledge based questions. <ul style="list-style-type: none"> Overview of game supported platforms e.g. Xbox, Nintendo, mobile devices etc Perform comparison between multiple game engines. Define environments e.g. Tone shade, medieval etc. <u>Practical Activity:</u>	Theory- 3 Hrs Practical- 6 Hrs Total- 9 Hrs	<ul style="list-style-type: none"> Computer System of minimum ci5 Internet Connectivity, Unity 2019 Version or any other 	Class Room/Computer lab



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	<ul style="list-style-type: none"> • Develop Game environment • Select suitable Game Environment 	<ul style="list-style-type: none"> • Search for different game engines and select suitable game engine. • State the reason of selecting your game engine and why your selected game engine is better than other one's. 		<ul style="list-style-type: none"> • Any IDE like Visual Studio Code 	
<p>LU 2. Install game development framework</p>	<p>Trainee will be able to</p> <ul style="list-style-type: none"> • Install Game development framework • Configure Game development framework 	<ul style="list-style-type: none"> • Explain setting up the development environment along their dependencies. E.g. supported editor for your Game engine for debugging. 	<p>Theory- 4 Hr Practical- 12 Hrs Total- 16 Hrs</p>	<ul style="list-style-type: none"> • Computer System of minimum ci5 • Internet Connectivity, • Unity 2019 Version or any other 	<p>Class Room/Computer lab</p>



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				Any IDE like Visual Studio Code	
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Module 0613-S&AD&A-2.Create New Project of gameplay

Objective: After the completion of this module the trainee will be able to will be able to write complete and efficient code to develop a new game.

Duration: 36 Hours Theory: 12 Hours Practice: 24 Hours Credit Hours: 3.6

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1. Set up game development environment	Trainee will be able to <ul style="list-style-type: none"> • Explore Framework Interface • Create Gameplay project • Make Scenes of gameplay • Make Game objects of gameplay. • Add interactivity to your Project. 	Knowledge based questions. <ul style="list-style-type: none"> • Explain the different tools of game engine e.g. move tool, scale tool and game object selection tool • Differentiate between 2d, 3d and hybrid environment • Explain the creation of 2d and 3d game project. 	Theory- 5 Hrs Practical- 9Hrs Total- 15 Hrs	<ul style="list-style-type: none"> • Computer System of minimum ci5 • Internet Connectivity, • Unity 2019 Version or any other • Any IDE like Visual Studio Code 	Class Room/Computer lab



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- Explain Scene view and multiple camera view in scenes.
- Define the types of supported game objects in Game engine e.g. Box, Spher, Circle etc.
- Explain the game physics and gravity applied on game objects.
- Define different type of colliders and triggers.

Practical Activity:

- Initialize the game object and collide them through game physics.



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<p>LU 2. Design game work flow</p>	<p>Trainee will be able to</p> <ul style="list-style-type: none"> • Design C# Script Flow Cycle • Design Code repositories • Create Scripts of Game Objects 	<ul style="list-style-type: none"> • Explain the game object life cycle, e.g. initialization and destroy. • Explain script assignment to game objects. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Write a script to translate and rotate a game object. 	<p>Theory- 4Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 10Hrs</p>	<ul style="list-style-type: none"> • Computer System of minimum ci5 • Internet Connectivity, • Unity 2019 Version or any other Any IDE like Visual Studio Code 	<p>Class Room/Computer lab</p>



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<p>LU 3. Explore Package Manager</p>	<p>Trainee will be able to</p> <ul style="list-style-type: none"> • Find specific version of each Package • Install new package from registry • Configure package from local folder • Edit the Project manifest to install packages from all location • Switch versions of a package already installed. • Remove a package from your Project. • Enable / Disable built-in packages. 	<p>Knowledge based questions.</p> <ul style="list-style-type: none"> • Explain the role of package manager in game engines. • Explain the sources of packages installation e.g. game store or registry etc. • Explain the project manifest file. • Explain the features of project setting and packages files in game engine. <p><u>Practical Activity:</u></p>	<p>Theory- 3 Hrs</p> <p>Practical- 9 Hrs</p> <p>Total- 12 Hrs</p>	<ul style="list-style-type: none"> • Computer System of minimum ci5 • Internet Connectivity, • Unity 2019 Version or any other Any IDE like Visual Studio Code 	<p>Class Room/Computer lab</p>



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	<ul style="list-style-type: none">• Debug packages for conflicts and errors	<ul style="list-style-type: none">• Show the list of installed packages in your project.			
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Module 0613-S&AD&A-3. Produce prototypes of gameplay ideas and features

Objective: After the completion of this module the trainee will be able to will be able to perform core mechanics of game development in any platform like Unity

Duration: 36 Hours **Theory:** 12 Hours **Practice:** 24 Hours **Credit Hours:** 3.6

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials	Learning
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				Required	Place
LU 1. Import Models of Gameplay	Trainee will be able to <ul style="list-style-type: none"> • Create/Import humanoid characters • Use humanoid characters in the game • Configure Model Import Settings • Import Assets which create outside of framework • Set Mode for 2D / 3D Graphic Interface 	Knowledge based questions. <ul style="list-style-type: none"> • Explain the supported format of assets (both 2d and 3d) for game engine. • Explain Import and export of 3d assets along their textures in your game engine. • Explain the exporting parameters from different designing tools e.g. Maya, 3ds Max and Illustrator etc. for game engines. • Explain the switching of game views from 2d to 3d and vice versa. Practical Activity: <ul style="list-style-type: none"> • Import a 3d assets from any designing tool along their 	Theory- 2Hrs Practical- 3Hrs Total- 5Hrs	<ul style="list-style-type: none"> • Computer System of minimum ci5 • Internet Connectivity, • Unity 2019 Version or any other • Any IDE like Visual Studio Code 	Class Room/Computer lab



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		dependencies and compare the game engine result with your designing tool			
LU 2. Explore Input Manager Window	Trainee will be able to <ul style="list-style-type: none"> Control Your Game through input Device Configure Mobile Device Input for gameplay Configure XR(X-Reality) Input for gameplay 	Knowledge based questions. <ul style="list-style-type: none"> Explain the different types of supported controls e.g... Mouse controls and touch controls in gaming. Define the gyro sensitivity. Practical Activity: <ul style="list-style-type: none"> Interact a game object through gyro sensor. 	Theory- 3Hrs Practical- 6Hrs Total- 9Hrs	<ul style="list-style-type: none"> Computer System of minimum ci5 Internet Connectivity, Unity 2019 Version or any other Any IDE like Visual Studio Code 	Class Room/Computer lab



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<p>LU 3. Make Real-time Global Illumination</p>	<p>Trainee will be able to</p> <ul style="list-style-type: none"> • Configure different render pipelines process • Use camera tool to create a scene space • Explore post-processing of Scene • Explore Graphic tools for create real-time Global Illumination 	<p>Knowledge based questions</p> <ul style="list-style-type: none"> • Explain the different types of renders in game engine. • Explain the different properties on camera in game scene. • Explain the different types of materials and shaders in game engine. • Explain different types of lighting e.g. baked light, point light etc. in your gaming engine. <p><u>Practical Activity:</u></p>	<p>Theory- 4 Hrs</p> <p>Practical- 9Hrs</p> <p>Total- 13Hrs</p>	<ul style="list-style-type: none"> • Computer System of minimum ci5 • Internet Connectivity, • Unity 2019 Version or any other <p>Any IDE like Visual Studio Code</p>	<p>Class Room/Computer lab</p>



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		<ul style="list-style-type: none"> • Create two game objects and illuminate both game objects using shaders only. • Create two cameras in single game scene and switch them at runtime. 			
<p>LU 4. Explore Physics Engines</p>	<p>Trainee will be able to</p> <ul style="list-style-type: none"> • Install 2D / 3D physics engines • Configure 2D / 3D physics engines 	<p>Knowledge based questions</p> <ul style="list-style-type: none"> • Explain the supported physics concepts in gaming. • Describe the multiple physics concepts applied on game objects e.g. Rigid body, Gravity and Kinetics etc <p><u>Practical Activity:</u></p>	<p>Theory- 3Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 9Hrs</p>	<ul style="list-style-type: none"> • Computer System of minimum ci5 • Internet Connectivity, • Unity 2019 Version or any other <p>Any IDE like Visual Studio Code</p>	<p>Class Room/Computer lab</p>



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		<ul style="list-style-type: none">• . Collide multiple game objects and apply a rigid body on one of the game object.			
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Module 0613-S&AD&A-4.Generate game scripts and storyboards

Objective: After the completion of this module the trainee will be able to will be able to perform core mechanics of game development in any platform like Unity

Duration: 36 Hours Theory: 12 Hours Practice: 24 Hours Credit Hours: 3.6

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1. Generate game scripts	Trainee will be able to <ul style="list-style-type: none"> • Create Script to respond input from the player • Create a structure that implements IJob. 	Knowledge based questions <ul style="list-style-type: none"> • Explain Threading and multithreading • Describe job scheduling. • Explain Job Scheduling life cycle. <u>Practical Activity:</u>	Theory-6 Hrs Practical- 9Hrs Total- 13Hrs	<ul style="list-style-type: none"> • Computer System of minimum ci5 • Internet Connectivity, • Unity 2019 Version or any other • Any IDE like Visual Studio Code 	Class Room/Computer lab



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		<ul style="list-style-type: none"> • Create two parallel jobs and instantiate translate game objects in each job. 			
LU 2. Use Plugins	Trainee will be able to <ul style="list-style-type: none"> • Explore plugins for different platforms • Install plugins where needed • Configure installed plugins 	<ul style="list-style-type: none"> • Explain the game store with respect to game engine, for importing the plugins. • Explain the FBX package import. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Search and import a third person controller package in your game project. 	Theory- 4Hrs Practical- 6Hrs Total-10 Hrs	<ul style="list-style-type: none"> • Computer System of minimum ci5 • Internet Connectivity, • Unity 2019 Version or any other IDE like Visual Studio Code 	Class Room/Computer lab



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<p>LU 3. Create Story Board</p>	<p>Trainee will be able to</p> <ul style="list-style-type: none"> • Control the networked state of the game • Send and receive network messages • Make remote procedure calls (RPCs) from servers to clients. • Send networked events from servers to clients. • Set a Multiplayer Project • Create matches / advertise matches. 	<p>Knowledge based questions</p> <ul style="list-style-type: none"> • Explain the multiplayer game • Describe the requirement for multiplayer game. • Explore the different packages for multiplayer shooter game. • Explain the client server architecture for your game project. <p><u>Practical Activity:</u></p>	<p>Theory-6 Hrs</p> <p>Practical- 9Hrs</p> <p>Total- 13Hrs</p>	<ul style="list-style-type: none"> • Computer System of minimum ci5 • Internet Connectivity, • Unity 2019 Version or any other IDE like Visual Studio Code 	<p>Class Room/Computer lab</p>



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		<ul style="list-style-type: none"> • Send a ping command from one device (either computer or mobile) to other device. • Write a script to validate your network state. 			
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Module0613-S&AD&A-5.Animate Characters and objects

Objective: After the completion of this module the trainee will be able to install gaming framework

Duration: 39 Hours Theory: 9 Hours Practice: 30 Hours Credit Hours: 3.9

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
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<p>LU 1. Create Animation of characters</p>	<p>Trainee will be able to</p> <ul style="list-style-type: none"> • Handle Mechanism System • Animate 2d sprite character • Animate 3d models character • Design Animator for the game object • Work with different Animations • Create Legacy, Humanoid / Generic Animations 	<p>Knowledge based questions</p> <ul style="list-style-type: none"> • Explain the different types of supported animations in game engine e.g. legacy • Describe the key framing in game engines. • Explain the 2d sprites animations. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create a character walk animation using 2d sprites. 	<p>Theory-5 Hrs</p> <p>Practical- 18Hrs</p> <p>Total- 23Hrs</p>	<ul style="list-style-type: none"> • Computer System • Internet Connection • Unity 2019 Version • Visual Studio 2019,Adobe Photoshop, Adobe Illustrator 	<p>Class Room/Computer lab</p>
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<p>LU 2. Manage the various animation states</p>	<p>Trainee will be able to</p> <ul style="list-style-type: none"> • Explore Animator Controller • Create Animator Controller • Configure Animator Controller • Use Animator Controller to set animations of characters 	<p>Knowledge based questions</p> <ul style="list-style-type: none"> • Explain the animator in game engines. • Describe the animations state management in game engines. • Explain the different features of animator controller e.g. Triggers, Gravity and layers etc. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Animate a 2d character using state machine. Minimum states will be Idle, Walk, Run 	<p>Theory-4 Hrs</p> <p>Practical- 12Hrs</p> <p>Total- 16Hrs</p>	<ul style="list-style-type: none"> • Computer System • Internet Connection • Unity 2019 Version <p>Visual Studio 2019,Adobe Photoshop, Adobe Illustrator</p>	<p>Class Room/Computer lab</p>
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Module 0613-S&AD&A-6.Insert Audio / video features of the game

Objective: After the completion of this module the trainee will be able to use audio and video features in the game.

Duration: 24 Hours Theory: 6 Hours Practice: 18 Hours Credit Hours: 2.4

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1. Add Audio features	Trainee will be able to <ul style="list-style-type: none">• Attach Audio source to objects• Add Audio Source to another object• Explore Different audio filters• Add Different Audio Filters• Explore Different Audio Plugins	Knowledge based questions <ul style="list-style-type: none">• Explain the different audio sources supported in game engine.• Describe the different type of audio filters e.g. pitch and noise control etc.• Explain the audio source settings at runtime using scripting.	Theory-4 Hrs Practical-9 Hrs Total- 13Hrs	<ul style="list-style-type: none">• Computer System• Unity 2019 Version• Visual Studio 2019	Class Room/Computer lab



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	<ul style="list-style-type: none"> • Install Audio plugin • Use Audio Plugin 	<p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Add an audio to game object and change it source at runtime using script only. • Change the volume of audio source at runtime. 			
<p>LU 2. Integrate video into your game</p>	<p>Trainee will be able to</p> <ul style="list-style-type: none"> • Explore Video Player Component • Configure Video Player Component • Migrate from Movie Texture to video player 	<p>Knowledge based questions</p> <ul style="list-style-type: none"> • Explain the Video player component and its properties e.g. loop, play on awake. Etc • Explain different type of video player render modes e.g. Camera Far Plan and transparency etc. • Explain different type of video player component aspect 	<p>Theory- 2Hrs</p> <p>Practical- 9Hrs</p> <p>Total- 11Hrs</p>	<ul style="list-style-type: none"> • Computer System • Unity 2019 Version • Visual Studio 2019 	<p>Class Room/Computer lab</p>



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ratios. E.g. Stretch, Fit Inside
etc

Practical Activity:

- Add an Video player component on a game object and assign its audio source at runtime using script.



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Module 0613-S&AD&A-7.Explore/use X -RealityObjective:

Objective: After the completion of this module the trainee will be able to use X-Reality plugins in VR applications

Duration: 20 Hours Theory: 5 Hours Practice: 15 Hours Credit Hours: 2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1. Use XR tools	Trainee will be able to <ul style="list-style-type: none"> Explore different types of X-Reality (XR) Install XR plugin Management System Configure XR plugin Management System 	Knowledge based questions <ul style="list-style-type: none"> Explain the X-Reality Explain the supported devices for XR. Explain the difference between Augmented Reality and Virtual Reality and their uses in real world. Practical Activity: <ul style="list-style-type: none"> Search the multiple SDK's used for XR 	Theory- 2Hrs Practical- 6Hrs Total- 8Hrs	<ul style="list-style-type: none"> Computer System Internet Connection Unity 2019 Version Visual Studio 2019 Android Device for testing VR Controller AR Scanner Camera device 	Class Room/Computer lab



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<p>LU 2. Set-up tracking in the XR plug-in framework</p>	<p>Trainee will be able to</p> <ul style="list-style-type: none"> • Start with a New Scene • Identify Your Scene types • Migrate a Simple Scene • Configure your project for XR 	<p>Knowledge based questions</p> <ul style="list-style-type: none"> • Explain the XR Project setup in game engine. • Describe the process of using XR SDK in your game project. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create a XR demo application and Show a 3d Object using any XR SDK in mobile application. 	<p>Theory- 3Hrs</p> <p>Practical- 9Hrs</p> <p>Total- 12Hrs</p>	<ul style="list-style-type: none"> • Computer System • Internet Connection • Unity 2019 Version • Visual Studio 2019 • Android Device for testing • VR Controller • AR Scanner Camera device 	<p>Class Room/Computer lab</p>
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Back-end Developer

Module 0613-S&AD&A-8 Implement Basic Programming Skills to apply Server-Side Architecture

Objective: After the completion of this module, the Trainee will be able to implement server side architecture for web applications.

Duration: 39 Hours

Theory: 12 Hours

Practice: 27 Hours

Credit Hours: 3.9

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Identify Architectural Components	Trainee will be able to: <ul style="list-style-type: none"> Search well-known architectural components List the components relevant to web application 	Knowledge based questions: <ul style="list-style-type: none"> Define Component. Describe Views of a Component Describe Principles of Component-Based Design. Explain characteristics of Components. 	Theory-2Hrs Practical-3Hrs Total- 5Hrs	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	Class Room/Computer lab



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		<ul style="list-style-type: none"> Describe Advantages Component-Based Architecture Enlist the main components of Web Application Enlist different web applications <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Create the business case for the system. 			
<p>LU2.</p> <p>Identify relationships among Architectural Components</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Analyze requirement specification Write the architectural components' dependency on other components 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Describe the elements of requirements analysis Explain architectural components and dependency on other components <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Creating the business case for the system. 	<p>Theory- 2Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 8Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE 	<p>Class Room</p> <p>/Computer Lab</p>



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		<ul style="list-style-type: none"> Understanding the requirements. 		<ul style="list-style-type: none"> GIT, GITHUB 	
LU3. Develop APIs for Architectural Components	Trainee will be able to: <ul style="list-style-type: none"> List the classes and interfaces required to develop architectural components List the methods associated with every class List the parameters and return types for all methods 	Knowledge based questions: <ul style="list-style-type: none"> Described class-based components Explain methods associated with every class Elaborate different types of parameters Practical Activity: <ul style="list-style-type: none"> Creating or selecting the architecture. 	Theory- 3Hrs Practical- 6Hrs Total- 9Hrs	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	Class Room /Computer Lab



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<p>LU4.</p> <p>Implement Architectural Components</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Write down the classes decided in developed APIs • Implement methods and interfaces 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe API classes and methods • Enlist different types of APIs • Describe difference between API and interface • Explain how API interface works <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Document and communicate the architecture. • Analyze the architecture. • Implementing the system based on the architecture. 	<p>Theory- 3Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 9Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Server side programming language (PHP, ASP, JSP etc.) • IDE • GIT, GITHUB 	<p>Class Room</p> <p>/Computer Lab</p>
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<p>LU5.</p> <p>Test Architectural Components</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Design unit tests for architectural components • Execute unit tests • Fix the bugs identified during testing 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe a unit test and its benefits • Explain Unit Testing Tools & Techniques • Describe how fix bugs in unit testing <p><u>Practical Activity:</u></p> <p>Perform Unit testing, tools and bug fixing</p>	<p>Theory- 2Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 8Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Server side programming language (PHP, ASP, JSP etc.) • IDE • GIT, GITHUB 	<p>Class Room</p> <p>/Computer Lab</p>
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Module 0613-S&AD&A-9 Integrate Database with Server Side Programming Language

Objective: After the completion of this module, the Trainee will be able to skills to design, develop database layer and also integrate database layer with other layers for web applications.

Duration: 20 Hours

Theory: 8 Hours

Practice: 12 Hours

Credit Hours: 2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Design Database	Trainee will be able to: <ul style="list-style-type: none"> Identify database entities Set relationship among database entities Create tables fulfilling database requirements 	Knowledge based questions: <ul style="list-style-type: none"> Define data, database and types of database Explain database entities Describe entities and attributes Explain entity set and relationship set in DBMS 	Theory-1Hrs Practical- 1.5Hrs Total- 2.5Hrs	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE 	Class Room /Computer Lab



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		<ul style="list-style-type: none"> Describe ways to create a table in database <p>Practical Activity: Create database and explore it.</p>		<ul style="list-style-type: none"> GIT, GITHUB 	
<p>LU2.</p> <p>Populate Database with Test Data</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Collect sample data for database Populate database with collected data 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Explain collect data samples Explain populate a Data Set with data <p>Practical Activity: Populate Database with sample data</p>	<p>Theory- 1Hrs</p> <p>Practical- 1.5Hrs</p> <p>Total- 2.5Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	<p>Class Room</p> <p>/Computer Lab</p>
<p>LU3.</p> <p>Develop Database APIs</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Write code to establish connection with database 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Discuss establish a connection with a database 	<p>Theory- 2Hrs</p> <p>Practical- 3Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp 	<p>Class Room</p> <p>/Computer Lab</p>



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	<ul style="list-style-type: none"> Write code to implement classes and interfaces 	<ul style="list-style-type: none"> Describe classes and interfaces used in database <p>Practical Activity:</p> <ul style="list-style-type: none"> Establish a secure connection with a database 	Total- 5Hrs	<ul style="list-style-type: none"> Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	
<p>LU4.</p> <p>Implement Database Operations</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Write code to implement database operations Implement complex database operations by using already implemented methods, classes and interfaces 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Describe basic database operation Explain performing a complex operations in a database <p>Practical Activity:</p> <ul style="list-style-type: none"> Implement basic and complex database operation 	<p>Theory- 2Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>



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<p>LU5.</p> <p>Test Operations</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> List test cases (unit tests) for database operations Execute test cases to validate database operations Fix the bugs if found 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Explain unit test and its benefits Describe Unit Testing Tools & Techniques Explain fix bugs in unit testing <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Test-Driven Database Development 	<p>Theory- 2Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>
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Module 0613-S&AD&A-10 Implement MVC Framework to Develop Web Application

Objective: After the completion of this module, the Trainee will be able to develop web application using Model view controller (MVC) framework.

Duration: 32 Hours

Theory: 14 Hours

Practice: 18 Hours

Credit Hours: 3.2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Explore MVC Options	Trainee will be able to: <ul style="list-style-type: none"> Search MVC options available in Market List the features of every MVC framework 	Knowledge based questions: <ul style="list-style-type: none"> Describe MVC Explain types, options and features of MVC Practical Activity: Perform MVC Options	Theory-2Hrs Practical-3Hrs Total- 5Hrs	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	Class Room Computer Lab



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<p>LU2.</p> <p>Select MVC framework</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Compare the features of every MVC framework Select a MVC framework as per requirements 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Describe features of each MVC and select as per requirements of project <p>Practical Activity:</p> <p>Explore MVC framework features and choose MVC Framework according project requirement</p>	<p>Theory- 2Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>
<p>LU3.</p> <p>Implement Model Layer</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Identify model entities Write methods/classes to store data into model Write methods/classes to update data into model Write method/classes to retrieve data from model 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Define model entity, identity them Explain CRUD operation using classes / methods in MVC <p>Practical Activity:</p> <ul style="list-style-type: none"> Perform CRUD Operation 	<p>Theory- 2Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE 	<p>Class Room</p> <p>Computer Lab</p>



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	<ul style="list-style-type: none"> Apply constraints on model operations 			<ul style="list-style-type: none"> GIT, GITHUB 	
LU4. Implement Controller Layer	Trainee will be able to: <ul style="list-style-type: none"> Identify the controller scenarios of application Implement the controller component of application 	Knowledge based questions: <ul style="list-style-type: none"> Describe controller according to project scenario and explain implement the controller in an MVC application Practical Activity: <ul style="list-style-type: none"> Implement controller in MVC based application. 	Theory- 2Hrs Practical- 3Hrs Total- 5Hrs	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	Class Room Computer Lab
LU5. Implement View Layer	Trainee will be able to: <ul style="list-style-type: none"> Identify the view classes Implement view classes, interfaces and methods 	Knowledge based questions: <ul style="list-style-type: none"> Elaborate View classes and how to implements Describe interface and methods 	Theory- 3Hrs	<ul style="list-style-type: none"> Computer Internet Connection Xampp 	Class Room Computer Lab



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		<p><u>Practical Activity:</u></p> <p>Implement View in MVS</p>	<p>Practical- 3Hrs Total- 6Hrs</p>	<ul style="list-style-type: none"> • Server side programming language (PHP, ASP, JSP etc.) • IDE • GIT, GITHUB 	
<p>LU6.</p> <p>Test the implementation of MVC Architecture</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • List test cases for model, view and controller classes • Execute test cases • Fix the bugs if found 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Discuss implementation of MVC Test Cases • Enlist Test cases And fix all the bugs if found <p><u>Practical Activity:</u></p> <p>Test the implementation of MVC Architecture</p>	<p>Theory- 3Hrs Practical- 3Hrs Total- 6Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Server side programming language (PHP, ASP, JSP etc.) • IDE • GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>



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Module 0613-S&AD&A-11 Integrate Views and Partial Views with MVC

Objective: After the completion of this module, the Trainee will be able to develop views and partial views for a web application and also integrate views and partial views with MVC architecture.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Design Views	Trainee will be able to: <ul style="list-style-type: none"> Collect the requirements to be fulfilled by views Add visual elements in views fulfilling the requirements Adjust visual elements keeping in view of UI/UX requirements 	Knowledge based questions: <ul style="list-style-type: none"> Describe Requirement Gathering Process for design views Describe how to add visual elements with the adjust keeping in view of UI/UX requirements 	Theory-2Hrs Practical- 3Hrs Total- 5Hrs	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server-side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	Class Room Computer Lab



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		<p><u>Practical Activity:</u> Design views</p>			
<p>LU2. Add views into View component of MVC</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Add designed views into view component of MVC • Identify the application data to be mapped onto view elements 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe views adding into view components • Explain application data mapped onto view elements <p><u>Practical Activity:</u> Add views adding into View component of MVC</p>	<p>Theory- 2Hrs Practical- 3Hrs Total- 8Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Server-side programming language (PHP, ASP, JSP etc.) • IDE • GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>
<p>LU3. Register view with Controller component</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Identify application scenario to be handled by view 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe Scenario-Based application Requirements to be 	<p>Theory- 2Hrs Practical- 3Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp 	<p>Class Room</p> <p>Computer Lab</p>



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	<ul style="list-style-type: none"> • Make necessary changes into controller component to register view with it 	<p>handled by view and manage necessary changes into attached controller component to register view</p> <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Explain register view with Controller component 	<p>Total- 5Hrs</p>	<ul style="list-style-type: none"> • Server-side programming language (PHP, ASP, JSP etc.) • IDE • GIT, GITHUB 	
<p>LU4.</p> <p>Map data from model component of MVC onto visual elements of views</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Identify the data values that will be mapped onto view elements • Implement mapping of data values onto view elements 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe data values that will be mapped onto view elements and implements this mapping <p><u>Practical Activity:</u></p>	<p>Theory- 3Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 6Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Server-side programming language (PHP, ASP, JSP etc.) • IDE • GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>



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		Map data from model component of MVC onto visual elements of views			
LU5. Test the views	Trainee will be able to: <ul style="list-style-type: none"> • Deploy the views in test environment • List all the unit tests for view mapping • Execute the unit tests on in testing environment • Fix the bugs if found 	Knowledge based questions: <ul style="list-style-type: none"> • Elaborate the views in test environment • Enlist available all unit tests for view mapping, execute all the unit tests and if find bugs fix them. <u>Practical Activity:</u> Test the views	Theory- 3Hrs Practical- 6Hrs Total- 9Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Server side programming language (PHP, ASP, JSP etc.) • IDE • GIT, GITHUB 	Class Room Computer Lab



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Module 0613-S&AD&A-12 Integrate Template Engine with MVC Application

Objective: After the completion of this module, the Trainee will be able to integrate the template engine with MVC application.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<p>LU1.</p> <p>Search the template engines</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Search the available template engines List the features offered by every engine 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Elaborate template engine and features <p><u>Practical Activity:</u> Search template engines and explore features</p>	<p>Theory- 1Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 4Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>



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<p>LU2.</p> <p>Select the template engine for application</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Compare the features offered by template engines • Select the template engine as per application requirements 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Elaborate comparison of template engine features and choose as per application requirements <p><u>Practical Activity:</u></p> <p>Choose the template engine for application requirements</p>	<p>Theory- 2Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Server side programming language (PHP, ASP, JSP etc.) • IDE • GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>
<p>LU3.</p> <p>Install the template engine with MVC application</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Download suitable template engine • Install the engine in the application environment • Adjust anti-virus and firewall to allow working of template engine 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Explain the process to Download and install template engine <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Install template engine 	<p>Theory- 2Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Server side programming language (PHP, ASP, JSP etc.) • IDE 	<p>Class Room</p> <p>Computer Lab</p>



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				<ul style="list-style-type: none"> • GIT, GITHUB 	
LU4. Configure the template engine	Trainee will be able to: <ul style="list-style-type: none"> • Identify the template files to be used by template engine • Configure the template engine as per application needs 	Knowledge based questions: <ul style="list-style-type: none"> • Describe template engine files directory and configuration Practical Activity: <ul style="list-style-type: none"> • Configure template engine. 	Theory- 2Hrs Practical- 3Hrs Total- 5Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Server side programming language (PHP, ASP, JSP etc.) • IDE • GIT, GITHUB 	Class Room Computer Lab
LU5. Create template files for application	Trainee will be able to: <ul style="list-style-type: none"> • Create the template files to be used by template engine 	Knowledge based questions: <ul style="list-style-type: none"> • Explain how add new files and folder directory in template engine according documentation 	Theory- 2Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp 	Class Room Computer Lab



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	<ul style="list-style-type: none"> Host the template files in appropriate folder where template engine suggests 	<p><u>Practical Activity:</u></p> <p>Add new directory in template engine according documentation</p>	<p>Practical- 3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	
<p>LU6.</p> <p>Test the functionality of template engine</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> List test cases for template engine Execute test cases Fix the bugs if found 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Describe the process of testing Application to check the functionality of template engine using list of test cases and find bugs with fixing <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Test application for check functionality of template engine using test cases with bug fixing 	<p>Theory- 3Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 6Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>



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Module 0613-S&AD&A-13 Prepare Web Views for Smart Devices

Objective: After the completion of this module, the Trainee will be able to develop web views for smart devices

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Make website responsive	Trainee will be able to: <ul style="list-style-type: none"> Add responsive meta tags into your pages Apply media queries to your layouts 	Knowledge based questions: <ul style="list-style-type: none"> Describe meta tags and, add into pages and manage layout using media query Practical Activity: <ul style="list-style-type: none"> Explain website responsive, meta tags for view and add media query for layout 	Theory-4Hrs Practical-6Hrs Total- 10Hrs	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	Class Room /Computer Lab



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<p>LU2.</p> <p>Use compressed images in your views</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Identify the images to be used into your views Compress the images before using them onto your views 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Describe page optimization and find images need to compress for page performance <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Perform page optimization and improve performance using compress large image sizes 	<p>Theory- 4Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 10Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	<p>Class Room</p> <p>/Computer Lab</p>
<p>LU3.</p> <p>Test the web views</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> List test cases for smart devices Execute test cases Fix the bugs 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Describe testing on smart devices, listing test cases, execute testing and find bugs with fixing <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Test the web views 	<p>Theory- 4Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 10Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE 	<p>Class Room</p> <p>/Computer Lab</p>



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				<ul style="list-style-type: none">• GIT, GITHUB	
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Software Configuration Manager – SCM

Module 0613-S&AD&A-14 Manage version control system to store repositories on cloud side

Objective: After the completion of this module, the Trainee will be able to manage and deploy any code versioning control system.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Setup Versioning Control System	Trainee will be able to: <ul style="list-style-type: none"> Setup version control system to store repositories on cloud side Setup / add user accounts on cloud repository Install / Setup local copy of repository on developer's systems 	Knowledge based questions: <ul style="list-style-type: none"> Describe version control and Cloud repository Brief introduction Local copies and its manipulation. Practical Activity: Setup Versioning Control System	Theory 6Hrs Practical- 9Hrs Total- 15Hrs	<ul style="list-style-type: none"> Computer Internet Connection Xampp Server side programming language (PHP, ASP, JSP etc.) IDE GIT, GITHUB 	Class Room Computer Lab



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<p>LU2.</p> <p>Use Versioning control system</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Integrate the local copy with development environment • Implement branches and sub-branches in version control system 	<p>Knowledge based questions:</p> <p>Describe following basics</p> <ul style="list-style-type: none"> • Branch and sub-branches • Version control • Dev environment • Understanding the integration of local copy with Dev environment. <p>: <u>Practical Activity:</u></p> <p>Use Versioning control system</p>	<p>Theory- 6Hrs</p> <p>Practical- 9Hrs</p> <p>Total- 15Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Server side programming language (PHP, ASP, JSP etc.) • IDE • GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>
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Module 0613-S&AD&A-15 Manage web and cloud Hosting

Objective: After the completion of this module, the Trainee will be able to find search and register a domain name.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Create account	Trainee will be able to: <ul style="list-style-type: none"> • Search a suitable registrar for domain name • Create Account on registrar platform • Set-up a profile 	Knowledge based questions: <ul style="list-style-type: none"> • Define Domain and hosting • Explain how to create account and setup profile with debit card setup <u>Practical Activity:</u> <ul style="list-style-type: none"> • Register user profile setup on platform 	Theory- 4Hrs Practical- 6Hrs Total- 10Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • Registrar (Namecheap, Pknic, Bluehost) 	Class Room Computer Lab



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<p>LU2.</p> <p>Search domain name with Extension</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Check Domain Name availability status with desire Top level domains (TLDs) • Select suitable platform as per requirement • Register a domain 	<p>Knowledge based questions:</p> <p>Describe followings:</p> <ul style="list-style-type: none"> - Search the domain name availability - Explain Top level domains (TLDs) - Explain register domain - SSL <p>Practical Activity:</p> <ul style="list-style-type: none"> • Search domain name and register 	<p>Theory- 4Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 10Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser Registrar (Namecheap, Pknic, Bluehost) 	<p>Class Room</p> <p>Computer Lab</p>
<p>LU3.</p> <p>Manage domains through provided Dashboard</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Explore Dashboard • Renew expired domain • Select Auto Renewal (if required) • Set domain duration • Transfer Domain • Activate Whois-Guard 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Explain followings <ul style="list-style-type: none"> - Dashboard feature - Add new domains, renew expire domains, redirect auto renewal - Domain duration depend on buying plan 	<p>Theory- 4Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 10Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser Registrar (Namecheap, Pknic, Bluehost) 	<p>Class Room</p> <p>Computer Lab</p>



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	<ul style="list-style-type: none">• Change custom name servers	<ul style="list-style-type: none">- Transfer and resell domain- Explore other features Whois-Guard and custom name server <p><u>Practical Activity:</u></p> <ul style="list-style-type: none">• Manage domains/multiple domains through dashboard			
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Module 0613-S&AD&A-16 Configure web server on local environment

Objective: After the completion of this module, the Trainee will be able to configure web server on local environment.

Duration: 15 Hours

Theory: 6 Hours

Practice: 9 Hours

Credit Hours: 1.5

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Configure network setting	Trainee will be able to: <ul style="list-style-type: none"> • Configure LAN • Configure Static IP on web server • Identify Network Topologies • Configure DSL 	Knowledge based questions: <ul style="list-style-type: none"> • Define LAN • Describe types of IP addresses • Narrate the process to configure DSL router <u>Practical Activity:</u> <ul style="list-style-type: none"> • Configure network setting . 	Theory-2Hrs Practical-3Hrs Total- 5Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • DSL Device • LAN 	Class Room Computer Lab



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<p>LU2.</p> <p>Manage Firewall</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Explore the functionality of firewall • Explore type of network attacks • Configure firewall • Explore Malwares • Configure antivirus • Scan and close unnecessary open ports • Configure DMZ (Demilitarized zone) 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Explain the Functionality of firewall • Explain type of network attacks • Describe different type of antivirus and Configure • Describe different types of malwares • Describe the function of port • Describe the configuration of DMZ <p><u>Practical Activity:</u></p> <p>Configure and manage firewall</p>	<p>Theory-</p> <p style="text-align: center;">2Hrs</p> <p>Practical-</p> <p style="text-align: center;">3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • DSL Device • LAN 	<p>Class Room</p> <p>Computer Lab</p>
<p>LU3.</p> <p>Configure Web Server</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Explore Different Web servers • Install Windows based Web servers 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Explain different types of Web servers 		<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • DSL Device 	<p>Class Room</p> <p>Computer Lab</p>



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	<ul style="list-style-type: none"> • Configure windows-based web servers • Host Websites developed in different technologies • Install web server on linux/unix based systems • Configure linux/unix-based web servers • Host Websites developed in different technologies 	<ul style="list-style-type: none"> • Describe install windows-based Web server • Explain web Hosting and how to deployed website • Install web server on linux/unix based systems and configuration <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create the architecture. 	<p>Theory- 2Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> • LAN 	
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Module 0613-S&AD&A-17 Configure/Manage indigenous open source Control Panel for Webhosting (Server end)

Objective: After the completion of this module, the Trainee will be able to configure web server on local environment.

Duration: 40 Hours

Theory: 16 Hours

Practice: 24 Hours

Credit Hours: 4

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Explore Hosting Management tool	Trainee will be able to: <ul style="list-style-type: none"> Explore different types of web-host manager Install web-host manager Explore web-host manager functionality 	Knowledge based questions: <ul style="list-style-type: none"> Describe type of web host manager Describe the process to install web host manger and functionality Practical Activity: Explore Hosting Management tools	 Theory-2Hrs Practical-3Hrs Total- 5Hrs	<ul style="list-style-type: none"> Computer Internet Connection Web Browser Web Server Web Host Manager (Webmin, Ispcfig, vestacp) GIT, GITHUB 	Class Room Computer Lab



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<p>LU2.</p> <p>Configure web-host manager</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Configure cPanel Settings • Manage Server Profiles • Manage server time • Configure Terminal setting • Configure tweak settings 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe cPanel Setting • Define Server Profiles And credentials • Describe files directory <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Configure the Web host manager 	<p>Theory-2Hrs</p> <p>Practical-3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • Web Server • Web Host Manager (Webmin, Ispconfig, vestacp) • GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>
<p>LU3.</p> <p>Manage Accounts on web Host manager</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Create a new account • Add a package • Manage resellers accounts • Terminate Accounts • Modify Accounts • Suspend Account 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe Account management <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Manage Accounts on web Host manager 	<p>Theory-2Hrs</p> <p>Practical-3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • Web Server • Web Host Manager (Webmin, 	<p>Class Room</p> <p>Computer Lab</p>



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				Ispconfig, vestacp) <ul style="list-style-type: none"> • GIT, GITHUB 	
LU4. Manage Transfers	Trainee will be able to: <ul style="list-style-type: none"> • Convert Addon domain to Account • Copy an account from another server • Review transfers and restores 	Knowledge based questions: <ul style="list-style-type: none"> • Describe domain addon and copy account from another server Practical Activity: Manage transfer and domain addon	Theory-2Hrs Practical-3Hrs Total- 5Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • Web Server • Web Host Manager (Webmin, Ispconfig, vestacp) • GIT, GITHUB 	Class Room Computer Lab
LU5. Manage Backups	Trainee will be able to: <ul style="list-style-type: none"> • Configure Backup • Restore Backup 	Knowledge based questions: <ul style="list-style-type: none"> • Describe Backup, types of backups and backup restore 	Theory-2Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser 	Class Room Computer Lab



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	<ul style="list-style-type: none"> Select user Backup Restore File and Directory Restore a Full backup/cpmove file 	<p><u>Practical Activity:</u></p> <p>Perform backup management</p>	<p>Practical- 3Hrs Total- 5Hrs</p>	<ul style="list-style-type: none"> Web Server Web Host Manager (Webmin, Ispconfig, vestacp) GIT, GITHUB GITHUB 	
<p>LU6.</p> <p>Manage DNS zones</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Add/Delete DNS zone Add an Entry for Your Hostname Edit DNS zone Edit MX Entry Edit Zone Templates Reset a DNS zone 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> Define Different DNS ZONES Describe DNS zone manage Add/Delete/Edit/Reset Define Zone template <p><u>Practical Activity:</u></p> <p>Perform DNS zone management</p>	<p>Theory-2Hrs Practical- 3Hrs Total- 5Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Web Browser Web Server Web Host Manager (Webmin, Ispconfig, vestacp) GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>



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<p>LU7.</p> <p>Manage Plugins</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Add/remove different Plugins • Configure Security & Firewall • Configure Scanner 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Explain Plugin, Plugin types, different ways to install, remove and update. • Explain security measures configures on firewall and scanner configuration <p><u>Practical Activity:</u></p> <p>Apply different types of DNS zones and SSL Certificate</p>	<p>Theory-2Hrs</p> <p>Practical-3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • Web Server • Web Host Manager (Webmin, Ispsconfig, vestacp) • GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>
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<p>LU8.</p> <p>Manage SSL/TLS</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Generate an SSL Certificate and signing request • Install an SSL Certificate on a domain • Manage Auto SSL • Manage SSL Hosts 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe SSL Certificate and how to install SSL Certificate on a domain • Describe manage Auto SSL and Hosts <p><u>Practical Activity:</u></p> <p>Manage SSL/TLS Certificates</p>	<p>Theory-2Hrs</p> <p>Practical-3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • Web Server • Web Host Manager (Webmin, Isconfig, vestacp) • GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>
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Module 0613-S&AD&A-18 Use Control panel to manage hosting (Client Account)

Objective: After the completion of this module, the Trainee will be able to configure control panel to manage hosting.

Duration: 25 Hours

Theory: 10 Hours

Practice: 15 Hours

Credit Hours: 2.5

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Manage Files for hosting	Trainee will be able to: <ul style="list-style-type: none"> • Manage Files through file manager. • Create a Web Disk account • Modify and manage images • Set a password to protect certain directories • Monitor your account's available space • Add FTP Accounts • Configure FTP Accounts 	Knowledge based questions: <ul style="list-style-type: none"> • Describe file manager • Describe manage files through file manager • Explain password protected certain directory • Explain followings <ul style="list-style-type: none"> - Add FTP Accounts - Configure FTP Accounts - Monitor visitors that are logged into your site through FTP 	Theory- 2Hrs Practical- 3Hrs Total- 5Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • Web Server • Web Host Manager (Webmin, Ispconfig, vestacp) • GIT, GITHUB 	Class Room Computer Lab



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	<ul style="list-style-type: none"> • Monitor visitors that are logged into your site through FTP • Create your website Backup • Create Git repositories • Manage Git repositories 	<ul style="list-style-type: none"> - Created and Manage Git Repositories <p><u>Practical Activity:</u> Manage hosting files, files disk account, permission file disk qota, add FTP account and Git repository</p>			
<p>LU2.</p> <p>Manage Databases of hosting site</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Create Database • Create database User • Add user to Database • Set privileges to users • Modify Databases 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe basics of database, Database users, Create/Edit/Delete Users and set users privileges • Describe Database Modification • Database Backups <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Manage Databases of hosting websites manage 	<p>Theory- 1Hrs</p> <p>Practical- 1.5Hrs</p> <p>Total- 2.5Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • Web Server • Web Host Manager (Webmin, Ispcnfig, vestacp) • GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>



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<p>LU3.</p> <p>Manage Domains for hosting</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Manage your domains • Create Addon Domain • Manage Subdomain • Configure your website available from another domain name • Manage redirects • Configure Zone Editor 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe manage domains • Define create addon domain • Describe Add new subdomain and configure with website • Define domain redirects <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Manage domains. 	<p>Theory- 1Hrs</p> <p>Practical- 1.5Hrs</p> <p>Total- 2.5Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • Web Server • Web Host Manager (Webmin, Isconfig, vestacp) • GIT, GITHUB 	<p>Class Room</p> <p>Computer Lab</p>
<p>LU4.</p> <p>Configure Email for Domain</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Configure Email Accounts • Create an Email Account Forwarder • Route a domain's incoming mail • Configure Email Filters 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe Email system • Define email account forwarder • Define email filters <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Configure Email system 	<p>Theory- 2Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • Web Server • Web Host Manager (Webmin, 	<p>Class Room</p> <p>Computer Lab</p>



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				Ispconfig, vestacp) <ul style="list-style-type: none"> • GIT, GITHUB 	
LU5. Manage Security for Domain Hosting	Trainee will be able to: <ul style="list-style-type: none"> • Configure SSH (Secure Shell) Access • Manage IP Blocker • Configure SSL (Secure Sockets Layer) / TLS (Transport Layer Security) 	Knowledge based questions: <ul style="list-style-type: none"> • Describe Domain security • Define SSH • Describe IP blocker • Explain Different types of Security protocols <u>Practical Activity:</u> <ul style="list-style-type: none"> • Perform Domain security management 	Theory- 2Hrs Practical- 3Hrs Total- 5Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • Web Server • Web Host Manager (Webmin, Ispconfig, vestacp) • GIT, GITHUB 	Class Room Computer Lab
LU6.	Trainee will be able to: <ul style="list-style-type: none"> • Configure Installation of CMS 	Knowledge based questions: <ul style="list-style-type: none"> • Describe CMS 	Theory- 2Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser 	Class Room Computer Lab



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<p>Install open-source CMS From Control panel</p>	<ul style="list-style-type: none">• Configure Database for CMS	<ul style="list-style-type: none">• Install open-source CMS with configure database from control panel <p><u>Practical Activity:</u> Install open-source CMS From Control panel</p>	<p>Practical- 3Hrs Total- 5Hrs</p>	<ul style="list-style-type: none">• Web Server• Web Host Manager (Webmin, Ispconfig, vestacp)• GIT, GITHUB	
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Module 0613-S&AD&A-19 Deploy Mobile applications and Games on cloud

Objective: After the completion of this module, the Trainee will be able to perform Deployment of Mobile Application Software and games.

Duration: 25 Hours

Theory: 10 Hours

Practice: 15 Hours

Credit Hours: 2.5

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Deploy application	Trainee will be able to: <ul style="list-style-type: none"> Identify the technology needs Select the suitable platform to deploy mobile application Deploy on live App repository like play store 	Knowledge based questions: <ul style="list-style-type: none"> Describe the prevalent trends in mobile app development market Describe deploy mobile application on suitable platform <u>Practical Activity:</u> <ul style="list-style-type: none"> Perform mobile application deployment 	Theory- 5Hrs Practical- 7.5Hrs Total- 12.5Hrs	<ul style="list-style-type: none"> Computer Internet Connection Web Browser App Stores Account (Google Play Store, Apple App Store, Samsung Glaxy APP) 	Class Room Computer Lab



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<p>LU2.</p> <p>Validate deployment</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Download / install app from Play store or any other repository • Run application on device • Verify if the application is running properly or not • Check for updates 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Describe how to Deploy Mobile applications with verifying running and updating properly <p><u>Practical Activity:</u></p> <p>Deploy and validate Mobile applications</p>	<p>Theory- 5Hrs</p> <p>Practical- 7.5Hrs</p> <p>Total- 12.55Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Web Browser • App Stores Account (Google Play Store, Apple App Store, Samsung Galaxy APP) 	<p>Class Room</p> <p>Computer Lab</p>
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Full Stack Developer

Module: 0613-S&AD&A-20. Gather/ elicitate client requirements

Objective: After the completion of this module, the Trainee will be able to gather functional and non-functional requirements from the clients

Duration: 42Hours

Theory: 18 Hours

Practice:24 Hours

Credit Hours: 4.2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1. Prepare plan to gather requirements	Trainee will be able to: <ul style="list-style-type: none"> Search different strategies to gather requirements List down the features of strategies Compare the strategies on basis of pros and cons Prepare formats of Interviews with clients 	<u>Knowledge based questions:</u> <ul style="list-style-type: none"> Enlist different strategy to gather requirement Enlist the features of the strategies. Explore the format of the interview with client. Define questionnaire to conduct a survey. 	Theory- 6Hrs Practical- 8Hrs Total- 14Hrs	<ul style="list-style-type: none"> Computer Internet Connection Survey gathering tools like survey monkey, Google forms Xampp Web Browsers 	<ul style="list-style-type: none"> Class Room Computer Lab



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	<ul style="list-style-type: none"> • Make Surveys through Questionnaires 	<p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create a questionnaire using a google form. 		<ul style="list-style-type: none"> • Server side programming language • MS Excel, MS word, Power point • IDE • Git , GitHub 	
<p>LU 2. Gather requirements to develop software</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Prepare Software requirement specification (SRS) Document • Prepare Prototyping or visuals based on SRS • Collect/Record the feedbacks after prototyping • Update SRS as per feedback 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define software requirement specification document. • Define prototyping. • Enlist the steps to get feedback through prototyping. 	<p>Theory- 6Hrs Practical- 8Hrs Total- 14Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Survey gathering tools like survey monkey, Google forms • Xampp • Web Browsers 	<ul style="list-style-type: none"> • Class Room • Computer Lab



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		<p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create a SRS document for student record. 		<ul style="list-style-type: none"> • Server side programming language • MS Excel, MS word, Power point • Git , GitHub 	
<p>LU 3. Validate Software Requirments</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Analyze SRS Document • Remove Ambiguities • Identify the Scope of work / Tasks • Identify the completeness of SRS 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Enlist and clarify the client requirements. • Describe the procedure to validate software requirement. • Explore the scope of work. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Analyze the Student record. 	<p>Theory- 6Hrs</p> <p>Practical- 8Hrs</p> <p>Total- 14Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Survey gathering tools like survey monkey, Google forms • Xampp • Web Browsers 	<ul style="list-style-type: none"> • Class Room • Computer Lab



National Vocational Certificate Level 5 for Mobile App, Web and Game Development



				<ul style="list-style-type: none">• Server side programming language• IDE• MS Excel, MS word, Power point• Git , GitHub	
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Module: 0613-S&AD&A-21. Write program for client side (using JS, JQuery, Angular/VUE)

- **Objective:** After the completion of this module, the Trainee will be able to
- Develop a responsive website using HTML, JS, CSS and bootstrap.
- Design a mockup according to the SRS document
- Make a form validation in JS

Duration: 42Hours

Theory: 18 Hours

Practice:24 Hours

Credit Hours: 4.2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1. Identify the structure and design of web pages	Trainee will be able to: <ul style="list-style-type: none"> • Identify the different components of web pages • Draft Design Layouts / mockups to implement design • Coordinate with Designers to Design the 	<u>Knowledge based questions:</u> <ul style="list-style-type: none"> • Enlist the key components of web pages. 	Theory- 4Hrs Practical- 3Hrs Total- 7Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Web Browsers • Server side programming language • IDE • Git , GitHub 	<ul style="list-style-type: none"> • Class Room • Computer Lab



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	<p>mockups according to the functional and non-functional requirements</p>	<ul style="list-style-type: none"> Describe the design layout/mockup design process. Describe functional and non-functional requirement. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Design a website home page for collage. 			
<p>LU 2. Develop features to enhance the user experience</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Strike a balance between functional and aesthetic design Maintain the brand consistency throughout design by identifying the fixed components of webpage 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Describe the difference between functional and aesthetic design. Enlist the fix component of webpage. 	<p>Theory- 4Hrs Practical- 6Hrs Total- 10Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Web Browsers Server side programming language IDE Git , GitHub 	<ul style="list-style-type: none"> Class Room Computer Lab



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	<ul style="list-style-type: none"> Improve the User Experience / User Interface 	<ul style="list-style-type: none"> Explore the user interface. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Enlist the key steps to Improve the UI/UX of the website for a collage. 			
<p>LU 3. Ensure optimized design for smartphones</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Identify different types of screens and hand held devices Implement the right framework to achieve the responsiveness 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Define Responsiveness. Define mockups. Describe the components of layout. Explain different types of screen sizes. 	<p>Theory- 4Hrs Practical- 6Hrs Total- 10Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Web Browsers Server side programing language IDE Git , GitHub 	<ul style="list-style-type: none"> Class Room Computer Lab



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	<ul style="list-style-type: none"> Implement the mockups to all screen sizes through frontend frameworks 	<p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Create a responsive webpage and also check there output on mobile devices. 			
<p>LU 4. Utilize a variety of markup languages to write web pages</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Identify the list of frontend frameworks that would be required to implement the frontend Implement the code (HTML, CSS, JS and frameworks) to generate the frontend layouts using frameworks according to mockups 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Enlist the frontend frameworks. Describe the tags of HTML. Enlist all types of form validation through JS. Enlist key components of CSS. Explore the AJAX and JQuery. 	<p>Theory- 3Hrs Practical- 6Hrs Total- 9Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Web Browsers Server side programing language IDE Git , GitHub 	<ul style="list-style-type: none"> Class Room Computer Lab



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	<ul style="list-style-type: none"> Refine the look and feel according to the mockups by customization process Make the webpages interactive by deploying, JS, JQuery/VUE/or any framework and Ajax Implement all type of form validations through JS 	<p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Create a simple webpage using CSS. 			
<p>LU 5. Optimize web pages for maximum speed and scalability</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Test the speed of loading of pages after functional requirements achieved. Optimize the loading page delays through refining logic and optimizing the image size , if needed Localize all the scripts if loading from web like 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Enlist the method to check the speed of loading after achieving functional requirement. Enlist the method to optimize the speed of loading the webpage. 	<p>Theory- 3Hrs Practical- 3Hrs Total- 6Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Web Browsers Server side programing language IDE Git , GitHub 	<ul style="list-style-type: none"> Class Room Computer Lab



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	<p>online css, js and frameworks</p> <ul style="list-style-type: none">• Use minified version of scripting, place scripts at the end of the page to improve efficiency and speed.	<ul style="list-style-type: none">• Explain minified version of scripting. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none">• Write a code to check the loading of webpage after implementing functional requirements.			
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Module: 0613-S&AD&A-22. Program a server side (using PHP/ASP/Python/Node JS)

Objective: After the completion of this module, the Trainee will be able perform backend development requirement by implementing code.

42Hours

Theory: 18 Hours

Practice:24 Hours

Credit Hours: 4.2

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU 1. Identify the architecture of web application	<ul style="list-style-type: none"> Compare available development technologies Choose the suitable technology Develop high-quality software design and architecture Identify suitable tools for programming Identify the scope of project Prepare a list of tasks 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Enlist the available development technologies. Enlist suitable tools for programming. Enlist the key steps to priorities the tasks. Enlist key components to make efficient application. <p><u>Practical Activity:</u></p>	<p>Theory- 6Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 9Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Web Browsers Server side programing language IDE Git , GitHub 	<ul style="list-style-type: none"> Class Room Computer Lab



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	<ul style="list-style-type: none"> • Prioritize the tasks • Design the architecture 	<ul style="list-style-type: none"> • Create architecture for your software. 			
LU 2. Manage Resources	<ul style="list-style-type: none"> • Identify the computing resources requirements • Make computing resource available • Install best suitable technology for development • Configure web development technology for development 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define resources management. • Enlist the key steps to define the suitable technology for development. • Enlist the steps to configure the website. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Install and configure best suitable technology for web development. 	<p>Theory- 3Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 9Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Web Browsers • Server side programming language • IDE • Git , GitHub 	<ul style="list-style-type: none"> • Class Room • Computer Lab



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LU 3. Develop robust application	<ul style="list-style-type: none"> Develop applications by producing clean, efficient code Automate tasks through appropriate tools and scripting Prepare Development Document 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Explore develop robust application. Enlist the key steps to producing clean and efficient code <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Prepare development document. 	<p>Theory- 4Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 9Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Web Browsers Server side programing language IDE Git , GitHub 	<ul style="list-style-type: none"> Class Room Computer Lab
LU 4. Perform testing of application	<ul style="list-style-type: none"> Debug the code Perform validation and verification testing 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Define testing. 	<p>Theory- 5Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 9Hrs</p>	<ul style="list-style-type: none"> Computer Internet Connection Xampp Web Browsers 	<ul style="list-style-type: none"> Class Room Computer Lab



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	<ul style="list-style-type: none">• Ensure software is up-to-date with latest technologies	<ul style="list-style-type: none">• Enlist different types of testing.• Describe difference between validation and testing. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none">• Write a code of unit testing to test web application.		<ul style="list-style-type: none">• Server side programming language• IDE• Git , GitHub	
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Module: 0613-S&AD&A-23. Program a Database (Using SQL, MySQL, SQLite, and PostgreSQL)

Objective: After the completion of this module the trainee will be able to

- Install Database
- Design, program, manipulate, test and Run the database
- Take backup and restore backups

Duration: 45 Hours

Theory: 18 Hours

Practice: 27 Hours

Credit Hours: 4.5

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Design the database	Trainee will be able to: <ul style="list-style-type: none">• Organize the required information	Knowledge based questions: <ul style="list-style-type: none">• Define the database.• Enlist key steps to create a database.	Theory- 6Hrs Practical- 9Hrs Total- 15Hrs	<ul style="list-style-type: none">• Computer• Internet Connection• Xampp• Web Browsers	<ul style="list-style-type: none">• Class Room• Computer Lab



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	<ul style="list-style-type: none">• Gather all types of information which needs to be recorded in the database• Divide the information into tables• Divide information items into major entities• Covert logical design to physical design• Turn information items into columns• Specify primary keys• Choose each table's primary key• Set up the table relationships• Analyze the design for errors.• Apply the normalization rules• Apply the data normalization rules to see if the tables are structured correctly	<ul style="list-style-type: none">• Describe the procedure to create a table.• Define physical and logical design.• Enlist the different form of normalization.• Explore the difference between primary and secondary key. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none">• Create two tables (with the name of student and results) and set primary and secondary for both tables.		<ul style="list-style-type: none">• Server side programming language• IDE• Git , GitHub	
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	<ul style="list-style-type: none"> • Create database • Create table • Create views 				
LU2. Manipulate the Database	Trainee will be able to: <ul style="list-style-type: none"> • Run SELECT statement with single table • Use SELECT statement with multiple tables using different JOINS • Apply different SQL filters to produce organized data (e.g. HAVING, ORDER BY, GROUP BY, DISTINCT etc.) • Run UPDATE statement to update the existing records • Run INSERT statement to insert single or multiple records 	<u>Knowledge based questions:</u> <ul style="list-style-type: none"> • Explore the CRUD operation. • Define the terms order by, group by, distinct. <u>Practical Activity:</u> <ul style="list-style-type: none"> • Create SQL query to insert multiple records. • Write SQL query to select only student name from a student table. 	Theory- 6Hrs Practical- 9Hrs Total- 15Hrs	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Web Browsers • Server side programming language • IDE • Git , GitHub 	<ul style="list-style-type: none"> • Class Room • Computer Lab



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	<ul style="list-style-type: none"> • Run DELETE statement to delete single or multiple records • Write store procedures • Define/Code functions for database • Use aggregate functions with SELECT clause 				
<p>LU3.</p> <p>Adminstrate the Database</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Install database management system • Install the database servers • Develop processes for optimizing database security • Set/Maintain database standards • Manage database access controls • Install database applications • Upgrade database applications 	<p>Knowledge based questions:</p> <ul style="list-style-type: none"> • Enlist the key step to install the DBMS. • Enlist the key steps to restore the database. • Define the term Database administrator. • Explore different database standards. <p>Practical Activity:</p> <ul style="list-style-type: none"> • Install database server. 	<p>Theory- 6Hrs</p> <p>Practical- 9Hrs</p> <p>Total- 15Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet Connection • Xampp • Web Browsers • Server side programing language • IDE • Git , GitHub 	<ul style="list-style-type: none"> • Class Room • Computer Lab



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	<ul style="list-style-type: none">• Manage database applications• Troubleshoot database errors• Create automation for repeating database tasks• Export the database backups• Restore database backups	<ul style="list-style-type: none">• Enlist the steps to optimize the database security.			
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Module: 0613-S&AD&A-24. Perform testing of application

Objective: After the completion of this module the trainee will be able to perform testing of business logic, efficiency of system, user interface, unit integration and compatibility.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform User Interface Testing	Trainee will be able to: <ul style="list-style-type: none"> • Check the responsiveness of application • Check the flow of application • Check non-functional requirements 	<u>Knowledge based questions:</u> <ul style="list-style-type: none"> • Enlist the procedure to write down the key non-functional requirement. • Enlist the procedure to write down the key functional requirement. 	Theory- Hrs Practical- Hrs Total- Hrs	<ul style="list-style-type: none"> • Computer • Internet • Web Browser (Google Chrome) • Web Security testing tools 	<ul style="list-style-type: none"> • Class Room • Computer Lab



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		<p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Perform UI Testing. 		<ul style="list-style-type: none"> • Performance testing tools • Git , GitHub 	
<p>LU2.</p> <p>Perform Unit Testing</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Identify test cases for unit testing • Write test cases for unit testing • Perform unit testing using testing tools 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define unit testing. • Explore test cases for unit testing. • Describe compatibility Testing <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Perform Unit Testing 	<p>Theory- Hrs</p> <p>Practical- Hrs</p> <p>Total- Hrs</p>	<ul style="list-style-type: none"> • Computer • Internet • Web Browser (Google Chrome) • Web Security testing tools • Performance testing tools • Git , GitHub 	<ul style="list-style-type: none"> • Class Room • Computer Lab



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<p>LU3.</p> <p>Perform integration testing</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Identify scenarios for integration Perform integration testing 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Explain UI integration test and execution <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Demonstrate UI integration test. 		<ul style="list-style-type: none"> Computer Internet Web Browser (Google Chrome) Web Security testing tools Performance testing tools Git , GitHub 	<ul style="list-style-type: none"> Class Room Computer Lab
<p>LU4.</p> <p>Perform Compatibility Testing</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Test application on different desktop browsers Test application on different mobile/devices browsers Check compatibility tests with different operating systems 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Describe compatibility testing Describe difference between compatibility testing and cross browser testing <p><u>Practical Activity:</u></p>		<ul style="list-style-type: none"> Computer Internet Web Browser (Google Chrome) Web Security testing tools Performance testing tools 	<ul style="list-style-type: none"> Class Room Computer Lab



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		<ul style="list-style-type: none"> Describe execution Compatibility Testing 		<ul style="list-style-type: none"> Git , GitHub 	
<p>LU5.</p> <p>Perform Security Testing</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Identify the application security needs (OS,Hardware,Frameworks etc.) Identify all potential threats and vulnerabilities Prepare the threat profile based on different vulnerabilities/risks Prepare the test plan Automate testing on top of the manual testing Prepare the security tests case document 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Describe security testing and types Describe Security measures Describe potential threats, vulnerabilities and action plans <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Describe Application Security Testing, find potential vulnerabilities and action plans 		<ul style="list-style-type: none"> Computer Internet Web Browser (Google Chrome) Web Security testing tools Performance testing tools Git , GitHub 	<ul style="list-style-type: none"> Class Room Computer Lab



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<p>LU6.</p> <p>Apply performance Testing</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Select tool for performance testing • Check performance under a heavy load using selected tool • Perform Stress testing to determine the breaking point of the application 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Describe the techniques and tools of performance testing • Describe automation testing and tools <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Demonstrate Application Performance Testing, techniques and tools 		<ul style="list-style-type: none"> • Computer • Internet • Web Browser (Google Chrome) • Web Security testing tools • Performance testing tools • Git , GitHub 	<ul style="list-style-type: none"> • Class Room • Computer Lab



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Module: 0613-S&AD&A-25. Manage project

Objective: After the completion of this module the trainee will be able to

- How to assign tasks among team members
- How to divide the work tasks and execute in team
- Routine Reporting of team members
- How to achieve goals and deadlines smartly

Duration: 45 Hours

Theory: 18 Hours

Practice: 27 Hours

Credit Hours: 4.5

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
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<p>LU1.</p> <p>Manage Project using project management Tools</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Identify suitable project management tools Install suitable project management tool Create user accounts on tasks manager 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Explain the project managements process and tools Describe tasks manager and create user <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> PerformProject management process and management tools. 	<p>Theory- Hrs</p> <p>Practical- Hrs</p> <p>Total- Hrs</p>	<ul style="list-style-type: none"> Computer Internet Web Browser (Google Chrome) Web Security testing tools Performance testing tools Git , GitHub 	<ul style="list-style-type: none"> Class Room Computer Lab
<p>LU2.</p> <p>Manage Tasks using Task Management Tools</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Identify tasks based on requirements Divide the project into multiple tasks 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Describe how to create jobs base task Describe how to divide job or multiple task and 	<p>Theory- Hrs</p> <p>Practical- Hrs</p> <p>Total- Hrs</p>	<ul style="list-style-type: none"> Computer Internet Web Browser (Google Chrome) 	<ul style="list-style-type: none"> Class Room Computer Lab



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	<ul style="list-style-type: none"> • Allocate Tasks to the team members according to the project management timeline • Set deadlines for team members • Conduct training of team members to update the status of task 	<p>allocation team member with time frame</p> <ul style="list-style-type: none"> • Describe how to team member update the status tasks or introduce automate time management system/tools <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Manage Tasks using Management tools to organize optimistic time framing approach. 		<ul style="list-style-type: none"> • Web Security testing tools • Performance testing tools • Git , GitHub 	
<p>LU3.</p> <p>Monitor project</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Identify milestones/deliverables • Prepare deadlines of deliverables 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Describe how to divide project into realistic calculated milestone • Describe meant by deadlines to achieve 		<ul style="list-style-type: none"> • Computer • Internet • Web Browser (Google Chrome) • Web Security testing tools 	<ul style="list-style-type: none"> • Class Room • Computer Lab



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	<ul style="list-style-type: none">• Prepare reports of deliverables	<p>milestone and how to achieve goals smartly</p> <ul style="list-style-type: none">• Describe reporting about status of milestones <p><u>Practical Activity:</u></p> <ul style="list-style-type: none">• Perform Project management job process to achieve milestones with projects deadlines and reporting job logs.		<ul style="list-style-type: none">• Performance testing tools• Git , GitHub	
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Android Developer

Module: 0613-S&AD&A-26. Build logic through Programming

Objective: After the completion of this module the trainee will be able to develop application using Object oriented programming language java and XML.

Duration: 31 Hours

Theory: 10 Hours

Practice: 21 Hours

Credit Hours: 3.1

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Set environment for Java	Trainee will be able to: <ul style="list-style-type: none">Install/configure JDKWrite/Code different programs using java/other languages for android development	<u>Knowledge based questions:</u> <ul style="list-style-type: none">Define JDK.Enlist different steps that are required to create android first program.Enlist different platforms for android application development.	Theory- 2Hrs Practical- 3Hrs Total- 5Hrs	<ul style="list-style-type: none">Computer (minimum 5th generation with 8 GB RAM and SSD drive)Internet ConnectionWeb Browsers	Class Room /Computer Lab



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		<p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Write a program for print a hello word application. 		<ul style="list-style-type: none"> Android Studio 	
<p>LU2.</p> <p>Build Complex Application</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Import libraries Build complex program using libraries 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Define dependencies. Enlist Different applications that are running using Android Studio. Explain various features of Android platform. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Create a new interface for the app that takes user input and switches to a new screen in the app to display it. 	<p>Theory- 3Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> Computer (minimum 5th generation with 8 GB RAM and SSD drive) Internet Connection Web Browsers Android Studio 	<p>Class Room</p> <p>/Computer Lab</p>



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<p>LU3.</p> <p>Build XML Application</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Explore XML Syntax • Build XML (eXtensible Markup Language) Application 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define XML. • Enlist different widget that are using in XML. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Write a XML code for Text view/ Buttons/View Groups. 	<p>Theory- 2Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 8Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room /Computer Lab</p>
<p>LU4.</p> <p>Explore Best Programming Practices</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Build code and implement best naming convention • Implement proper indentation • Implement other best practices 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define OOP. • Describe Structure of Object Oriented Programming. • Enlist main principles of OOP (Encapsulation, Abstraction, Inheritance, Polymorphism) • Describe benefits of OOP. 	<p>Theory- 2Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 8Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room /Computer Lab</p>



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		<p><u>Practical Activity:</u></p> <ul style="list-style-type: none">• Show a sample application that is already build with best programming practices.			
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Module: 0613-S&AD&A-27. Install/Configure Android Studio

Objective: After the completion of this module the trainee will be able to:

- Install JDK, Android Studio and configure environment variable
- Configure Android Studio to setup mobile application development environment.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Install Android Studio	Trainee will be able to: <ul style="list-style-type: none">• Download any latest version of android studio• Install android studio• Install Software Development Kit (SDK) for required	<u>Knowledge based questions:</u> <ul style="list-style-type: none">• Define SDK.• Explain different version of Android Studio. <u>Practical Activity:</u> <ul style="list-style-type: none">• Check for latest version of Android Studio.	Theory- 6Hrs Practical- 9Hrs	<ul style="list-style-type: none">• Computer (minimum 5th generation with 8 GB RAM and SSD drive)• Internet Connection	Class Room /Computer Lab



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	<p>application programming interface (API) Level</p> <ul style="list-style-type: none"> • Download required system Images for Android Virtual Device (AVD) • Install required system Images for Android Virtual Device (AVD) 		<p>Total- 15Hrs</p>	<ul style="list-style-type: none"> • Web Browsers • Android Studio 	
<p>LU2.</p> <p>Configure Android Studio</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Explore Android Studio options • Configure Android Virtual Device (AVD) • Set environment variables as per requirement 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define AVD. • Enlist different platforms for android application development. • Explain how Android studio provides the fastest tools for building apps on every type of Android device. <p><u>Practical Activity:</u></p> <p>PRACTICAL ACTIVITY MISSING</p>	<p>Theory- 6Hrs</p> <p>Practical- 9Hrs</p> <p>Total- 15Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room /Computer Lab</p>



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Module: 0613-S&AD&A-28. Build Mobile Application

Objective: After the completion of this module the trainee will be able to:

- The Project structure
- The Building blocks of android application,
- How to create activities,
- How to create a multi-screen application?
- What is implicit, explicit intents
- How to communicate between activities.

Duration: 36 Hours

Theory: 12 Hours

Practice: 24 Hours

Credit Hours: 3.6

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Build first Application	Trainee will be able to: <ul style="list-style-type: none"> • Create new project • Choose suitable API and language 	<u>Knowledge based questions:</u> <ul style="list-style-type: none"> • Enlist the key purpose of the java • Explore API. • Enlist the key activity of Android development process. • Describe functionality of Gradle. 	Theory- 3Hrs Practical- 3Hrs	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) 	Class Room /Computer Lab



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	<ul style="list-style-type: none"> Run first application to Emulator and a device 	<ul style="list-style-type: none"> Explain how to connect your device to your development machine with a USB cable to run the application. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Write a program for print a Random Number application. 	<p>Total- 6Hrs</p>	<ul style="list-style-type: none"> Internet Connection Web Browsers Android Studio 	
<p>LU2.</p> <p>Build Application using different layouts and UI Components</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Add views in the Constraint Layout editor Update the UI dynamically depending on user input Update Mobile application layout to perform well in portrait and landscape mode Write code in all lifecycle functions and observe the output 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Define Layout Editor. Describe hierarchy of layout and widgets. Explore landscape and portrait mode in Android. Enlist activity lifecycle. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Write a program using interactive UI that describe lifecycle of activity. 	<p>Theory- 3Hrs</p> <p>Practical- 6Hrs</p> <p>Total- 9Hrs</p>	<ul style="list-style-type: none"> Computer (minimum 5th generation with 8 GB RAM and SSD drive) Internet Connection Web Browsers Android Studio 	<p>Class Room /Computer Lab</p>



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<p>LU3.</p> <p>Handle Intents</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Create new activities • Start activities by sending an explicit Intents • Start a new activity by sending an implicit intent that looks for an activity to handle the request. 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Elaborate the concept of Activities. • Describe Manifest File. • Enlist use of intents and types of intents. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create an application that moving from Activity A to B, B to C and C to A. 	<p>Theory- 1Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 4Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room</p> <p>/Computer Lab</p>



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<p>LU4.</p> <p>Create service</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Explore android studio services • Create service in android studio • Transfer data between services and activities. 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define Services. • Enlist Types of Services. • Enlist the lifecycle callback. • Declare service in manifest <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create application that printing the counting in background. 	<p>Theory- 4Hrs</p> <p>Practical- 9Hrs</p> <p>Total- 13Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room /Computer Lab</p>
<p>LU5.</p> <p>Configure Gradle</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Explore Gradle files • Add libraries • Explore the features of the Gradle Android plugin and build process. 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define the build process. • Define the dependencies. • Elaborate android build glossary. • Describe build configuration file. <p><u>Practical Activity:</u></p>	<p>Theory- 1Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 4Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) 	<p>Class Room /Computer Lab</p>



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	<ul style="list-style-type: none">• Build an Android app with free and paid product flavors.	<ul style="list-style-type: none">• Implement any library to ensure the working flow of gradle file.		<ul style="list-style-type: none">• Internet Connection• Web Browsers• Android Studio	
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Module: 0613-S&AD&A-29. Build robust UI for greater UX (user experience)

Objective: After the completion of this module the trainee will be able to:

- Create mobile application development environment.
- Build different components of Mobile applications
- Integrate components with activities
- Customize themes and styles.
- Create accessible and easily localizable apps.
- Define UI Testing and the Espresso Framework.
- Perform manual testing and automated Testing.
- How to Espresso and UI Automator.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3



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Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
<p>LU1.</p> <p>Design basic graphics</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Build activity on android studio • Use image buttons, clickable images and input controls in activity • Setup application bar and option menu in application. • Use alert dialog and date picker. • Add tabs to application. 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Explore the themes and styles. • Enlist the steps to create and apply a style • Describe Style hierarchy. • Describe Tollbars • Explain Fragments • Create Dialog Fragment. • Create swipe Views with the tabs using view pager. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create application that implement fragments, tabs using tab layout. • Create application that takes user input and display input. 	<p>Theory- 6Hrs</p> <p>Practical- 9Hrs</p> <p>Total- 15Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room</p> <ul style="list-style-type: none"> • /Computer Lab



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<p>LU2.</p> <p>Make a user friendly interface</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Add drawables, styles and themes to app • Apply material design guidelines to lists and cards. • Apply material design colors. • Use resource layout folders in different orientations and screen sizes. • Use Espresso, a mechanism for recording user interactions, to test app's user interface. 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define drawable. • Describe material design. • Elaborate window size classes. • Create flexible/alternative layout. • Describe Espresso. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Write concise, beautiful and reliable Android test using Espresso 	<p>Theory- 6Hrs</p> <p>Practical- 9Hrs</p> <p>Total- 15Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room /Computer Lab</p>



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Module: 0613-S&AD&A-30. Test, Debug and use support libraries

Objective: After the completion of this module the trainee will be able to:

- Create adaptive, responsive user interfaces that work across a wide range of devices.
- Create engaging, responsive interfaces that use material design principles.
- Test app's user interface.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1.	<p>Trainee will be able to:</p> <ul style="list-style-type: none">• Explore the type of bugs• Troubleshoot problems and debug code.	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none">• Define ANR.• Describe the functionality of the debugger.	<p>Theory- 4Hrs</p> <p>Practical- 6Hrs</p>	<ul style="list-style-type: none">• Computer (minimum 5th generation with	Class Room /Computer Lab



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<p>Debug application using android studio debugger</p>		<ul style="list-style-type: none"> • Enlist the key steps of works with the breakpoints. • Enlist different steps that are required to debug the program. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Write log messages in your code. 	<p>Total- 10Hrs</p>	<p>8 GB RAM and SSD drive)</p> <ul style="list-style-type: none"> • Internet Connection • Web Browsers • Android Studio 	
<p>LU2. Test Application using Junit</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Create local unit testing using Junit • Build test cases • Run test 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define test types. • Explore instrumented test for a build variant • Explain configure Gradle test options. • Enlist test results. <p><u>Practical Activity:</u></p>	<p>Theory- 4Hrs Practical- 6Hrs Total- 10Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room /Computer Lab</p>



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		<ul style="list-style-type: none"> Write a program that perform unit testing. 			
LU3. Make Application for backward compatible	Trainee will be able to: <ul style="list-style-type: none"> Explore Android Support libraries Use support libraries to get backward compatible version of new Android features 	<u>Knowledge based questions:</u> <ul style="list-style-type: none"> Define SDK versions. Explain minimum and target API level. Describe version-aware activity layout. <u>Practical Activity:</u> <ul style="list-style-type: none"> Write a program that check the android build version at runtime. 	Theory- 4Hrs Practical- 6Hrs Total- 10Hrs	<ul style="list-style-type: none"> Computer (minimum 5th generation with 8 GB RAM and SSD drive) Internet Connection Web Browsers Android Studio 	Class Room /Computer Lab



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Module: 0613-S&AD&A-31. Program/use background applications

- Objective:** After the completion of this module the trainee will be able to Connect to the Internet in a background thread to find the author of any book and also build apps that send notifications and schedule tasks, and you learn how to implement scheduling functionality for apps that run on earlier versions of Android.

Duration: 30 Hours

Theory: 12 Hours

Practice: 18 Hours

Credit Hours: 3

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Run background tasks	Trainee will be able to: <ul style="list-style-type: none">Add background threads to run a task in the background.	<u>Knowledge based questions:</u> <ul style="list-style-type: none">Describe Threads.Define the background work.Explain Broadcast receiver.Explain categories of background task.	Theory- 4Hrs Practical- 6Hrs	<ul style="list-style-type: none">Computer (minimum 5th generation with 8 GB RAM and SSD drive)	Class Room /Computer Lab



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	<ul style="list-style-type: none"> • Enable app to connect to the internet using a background task. • Update task keeps running if the user changes their device's orientation. • Responds to a system broadcast. • Send and receive a custom broadcast. • Use Job Scheduler to schedule tasks in a way that reduces battery drain. • Schedule and cancel an alarm. • Create code to integrate API 	<ul style="list-style-type: none"> • Construct a Job Info object with specific constraints. • Define how to schedule a Job Service based on the job info object. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create an application that display battery status using broadcast receiver. • Create application that implement a job service that delivers a simple notification to let the user know the job is running. 	Total- 10Hrs	<ul style="list-style-type: none"> • Internet Connection • Web Browsers • Android Studio 	
LU2. Authorize/ Use APIs in code	Trainee will be able to: <ul style="list-style-type: none"> • Authorize API • Use REST API 	<u>Knowledge based questions:</u> <ul style="list-style-type: none"> • Define REST API. • Elaborate google API. • Describe Google maps. 	Theory- 3Hrs	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 	Class Room /Computer Lab



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	<ul style="list-style-type: none"> Use Google APIs 	<ul style="list-style-type: none"> Explain the API library. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> Write a program that implement google map api show a map into an activity. 	<p>Practical- 6Hrs</p> <p>Total- 7Hrs</p>	<p>8 GB RAM and SSD drive)</p> <ul style="list-style-type: none"> Internet Connection Web Browsers Android Studio 	
<p>LU3.</p> <p>Mange notifications</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Send a notification. update a notification. 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> Define Notification builder. Enlist types of Notifications. Describe how to Update or cancel existing notification. <u>Practical Activity:</u> Build an application that create a notification on button click. Create application that delivers a notification when the time is 10.00 am. 	<p>Theory- 2Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 5Hrs</p>	<ul style="list-style-type: none"> Computer (minimum 5th generation with 8 GB RAM and SSD drive) Internet Connection Web Browsers Android Studio 	<p>Class Room /Computer Lab</p>



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<p>LU4.</p> <p>Make Application for backward compatible</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Explore Android Support libraries • Use support libraries to get backward compatible version of new Android features 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define SDK versions. • Elaborate minimum and target API level. • Describe version-aware activity layout. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Write a program that check the android build version at runtime. 	<p>Theory- 3Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 6Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room /Computer Lab</p>



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Module: 0613-S&AD&A-32. Save user data/Integrate android application with database

Objective: After the completion of this module the trainee will be able to develop application using Object oriented programming language java and XML.

Duration: 15 Hours

Theory: 6 Hours

Practice: 9 Hours

Credit Hours: 1.5

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Manuplate data using Shared Preferences	Trainee will be able to: <ul style="list-style-type: none"> Use Shared Preferences to save and retrieve user preferences. Add a settings activity to an app to save the user's preferred app settings. 	<u>Knowledge based questions:</u> <ul style="list-style-type: none"> Define Shared preferences. Enlist different steps to perform settings options to create android application. <u>Practical Activity:</u> <ul style="list-style-type: none"> Write a program for save and show data in shared preferences. 	Theory- 0.5Hrs Practical- 1.5Hrs Total- 2Hrs	<ul style="list-style-type: none"> Computer (minimum 5th generation with 8 GB RAM and SSD drive) Internet Connection Web Browsers Android Studio 	Class Room /Computer Lab



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<p>LU2.</p> <p>Manuplate data using File I/O</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Build activity to store data in file • Add/update and delete data from file 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define Files, input output stream. • Explain data and file storage. • Explain permission handling for saving and fetching files from mobile. • Enlist how to show all files on a storage device. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create an application for store data in File. • Create an application for get data from File. 	<p>Theory- 1Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 4Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room /Computer Lab</p>
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<p>LU3.</p> <p>Manuplate data in SQLite</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Create database in SQLite database • Add / update and delete data 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define SQLite. • Save data using SQLite • Define a schema and contract. • Create a database using an SQL helper. • Define CRUD operation. <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create application using SQLite and perform CRUD operation. 	<p>Theory- 1Hrs</p> <p>Practical- 3Hrs</p> <p>Total- 4Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room /Computer Lab</p>
<p>LU4.</p> <p>Manuplate storage using Room</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Use Android's Room to save and retrieve data in the database. • Add / update and delete data 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define Room Database. • Describe primary components. • Describe Sample Implementation of room. • Simplify one-to-many queries via @relation. 	<p>Theory- 1Hrs</p> <p>Practical- 1.5Hrs</p> <p>Total- 2.5Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers 	<p>Class Room /Computer Lab</p>



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		<p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create application using that using room database and implement CRUD operation. 		<ul style="list-style-type: none"> • Android Studio 	
<p>LU5.</p> <p>Manuplate data using online databases</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Create online database (Like firebase) • Import libraries to connect with database • Store, update, retrieve and update data 	<p><u>Knowledge based questions:</u></p> <ul style="list-style-type: none"> • Define Cloud storage. • Define JSON format. • Describe API. • Enlist different libraries that access Cloud Database. i.e.: (Retrofit, volley, http) <p><u>Practical Activity:</u></p> <ul style="list-style-type: none"> • Create application that using any library and access random Api. 	<p>Theory- 1Hrs</p> <p>Practical- 1.5Hrs</p> <p>Total- 2.5Hrs</p>	<ul style="list-style-type: none"> • Computer (minimum 5th generation with 8 GB RAM and SSD drive) • Internet Connection • Web Browsers • Android Studio 	<p>Class Room /Computer Lab</p>



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Members of Curriculum Development Meeting

S#	Name	Designation
1.	Hamza Nadeem	NAVTTTC Coordinator Islamabad
2.	Mr Aijaz Ahmed Zia	DACUM Expert, Lahore
3.	Ms. Tayyaba Amin	Sr. Instructor CIT, PGA, Lahore Representative P-TEVTA
4.	Muhammad Tahir Shafi	Advance Web Instructor KICS-UET Lahore
5.	Mr. Fawad Ali	Android Application Developer Mobi Droid Technologies, Lahore
6.	Syeda Farah Rehman	Sr. Instructor IT, GTTI Gulberg Lahore Representative P-TEVTA



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7.	Ms. Anam Yaseen	CBT&A Assessor, GCU Faisalabad
8.	Ms. Javeria Qazi	Web administrator, Representative PBTE
9.	Mr. Shadab Ali	Assistant Professor, KP TEVTA
10.	Mr. Talat Saeed	Instructor Computer Science, Representative S-TEVTA
11.	Mr. Adeel Abbas	Team Lead, Fast University (Research Lab) Islamabad
12.	Mr. Rehan Ahmad	Assistant Professor, UOL Lahore
13.	Dr. Muhammad Hamid	Asstt Professor, IT department UVAS Lahore



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14.	Mr. Mubasher Ali	Sr. Software Engineer, ARTICARE Islamabad
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