

Government of Pakistan

National Vocational and Technical Training Commission

Prime Minister's Hunarmand Pakistan Program

"Skills for All"



Course Contents / Lesson Plan

Course Title: Smart IoT Technologies for Agriculture

Duration: 3 Months

Revised Edition

Trainer Name	
Course Title	Smart IoT Technologies for Agriculture
Objectives and Expectations	<p>Employable skills and hands on practice for Smart IoT Technologies for Agriculture.</p> <p>This Course provides an opportunity to build a great career in the field of agriculture development, course start from basic level and then move towards the advance level. Starting from introduction of IOT in Agriculture then move towards design principles and patterns of IOT. This course will cover the different aspects for Smart IoT Technologies for Agriculture.</p> <p>Main Expectations:</p> <p>In short, the course under reference should be delivered by professional instructors in such robust hands- on manner that the trainees are comfortably able to employ their skills for earning money (through wage/self-employment) at its conclusion.</p> <p>This course thus clearly goes beyond the domain of the traditional training practices in vogue and underscores an expectation that a market centric approach will be adopted as the main driving force while delivering it. The instructors should therefore be experienced enough to be able to identify the training needs for the possible market roles available out there. Moreover, they should also know the strengths and weaknesses of each individual trainee to prepare them for such market roles during/after the training.</p> <ul style="list-style-type: none"> i- Specially designed practical tasks to be performed by the trainees have been included in the Annexure-I to this document. The record of all tasks performed individually or in groups must be preserved by the management of the training Institute clearly labeling name, trade, session etc so that these are ready to be physically inspected/verified through monitoring visits from time to time. The weekly distribution of tasks has also been indicated in the weekly lesson plan given in this document. ii- In order to materialize the main expectations, a special module on Job Search & Entrepreneurial Skills has been included in the later part of this course (5th & 6th month) through which, the trainees will be made aware of the Job search techniques in the local as well as international job markets (Gulf countries). Awareness around the visa process and immigration laws of the most favored labor destination countries also forms a part of this module. Moreover, the trainees would also be encouraged to venture into self-employment and exposed to the main requirements in this regard. It is also expected that a sense of civic duties/roles and responsibilities will also be inculcated in the trainees to make them responsible citizens of the country. iii- A module on Workplace Ethics has also been included to highlight the importance of good and positive behavior at work place in the line with the best practices elsewhere in the world. An outline of such qualities has been given in the Appendix to this document. Its importance should be conveyed in a format that is attractive and interesting for the trainees such as through PPT slides +short video documentaries. Needless to say, that if the training provider puts his heart and soul into these otherwise non-technical components, the image of Pakistani workforce would undergo a positive transformation in the local as well as international job markets. <p>In order to maintain interest and motivation of the trainees throughout the course, modern techniques such as:</p> <ul style="list-style-type: none"> • Motivational Lectures • Success Stories <p>These techniques would be employed as an additional training tool wherever possible (these are</p>

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explained in the subsequent section on Training Methodology).

Lastly, evaluation of the competencies acquired by the trainees will be done objectively at various stages of the training and a proper record of the same will be maintained. Suffice to say that for such evaluations, practical tasks would be designed by the training providers to gauge the problem-solving abilities of the trainees.

(i) **Motivational Lectures**

The proposed methodology for the training under reference employs motivation as a tool. Hence besides the purely technical content, a trainer is required to include elements of motivation in his/her lecture. To inspire the trainees to utilize the training opportunity to the full and strive towards professional excellence. Motivational lectures may also include general topics such as the importance of moral values and civic role & responsibilities as a Pakistani. A motivational lecture should be delivered with enough zeal to produce a deep impact on the trainees. It may comprise of the following:

- Clear Purpose to convey message to trainees effectively.
- Personal Story to quote as an example to follow.
- Trainees fit so that the situation is actionable by trainees and does not represent a just idealism.
- Ending Points to persuade the trainees on changing themselves.

A good motivational lecture should help drive creativity, curiosity and spark the desire needed for trainees to want to learn more. Impact of a successful motivational strategy is amongst others commonly visible in increased class participation ratios. It increases the trainees' willingness to be engaged on the practical tasks for longer time without boredom and loss of interest because they can clearly see in their mind's eye where their hard work would take them in short (1-3 years); medium (3 -10 years) and long term (more than 10 years).

As this tool is expected that the training providers would make arrangements for regular well planned motivational lectures as part of a coordinated strategy interspersed throughout the training period as suggested in the weekly lesson plans in this document.

Course related motivational lecture online link is available in annexure II.

(ii) **Success Stories**

- **Smart IoT Farm (PMAS-AAUR):** University Research Farm Koont on regular basis for monitoring & Evaluation of different field crops, to monitor the working of IoT based sensors, weather station & solar panels installed there. The team also visits for data collection of citrus, groundnut, potato and other seasonal field crops, for the collection of images of weeds. Field Staff also visit for crop harvesting, cleaning of different instruments, preparation of land and eradication of weeds from the crop.
<https://ddsdp.uaar.edu.pk/>
- **Telenor Pakistan - Connected Agriculture:** Telenor Pakistan has been involved in promoting connected agriculture initiatives. They have worked on projects that leverage IoT devices for monitoring and controlling agricultural processes. For instance, using IoT sensors to monitor soil conditions and automate irrigation based on real-time data.
<https://www.telenor.com.pk/press-release/telenor-pakistan-continues-to-lead-the-way-in-mobile-agriculture-with-launch-of-connected-agriculture-program-for-punjab-capp/>
- **Punjab Information Technology Board (PITB) Initiatives:** Government bodies and technology boards in Pakistan, such as the PITB, have shown interest in utilizing technology for agriculture. While specific success stories may not be available, there have been initiatives to introduce technologies, including IoT, for improving agricultural practices and increasing yields.
<https://pitb.gov.pk/>
- **Ufone Agri-Tech Solutions:** Telecom operators in Pakistan, including Ufone, have explored Agri-tech solutions. These solutions often involve the deployment of IoT sensors and connectivity to enable farmers to monitor and manage their farms more effectively. For example, monitoring soil moisture levels and automating irrigation.
<https://www.ufone.com/bakhabar-kissan/>
- **Zameen.com - Farm Management Solutions:** Zameen.com, a Pakistani real estate and

	<p>property portal, has ventured into smart farming solutions. While not exclusively focused on IoT, their efforts include providing farmers with technology tools to manage their farms efficiently.</p> <p>https://www.google.com/search?q=%E2%80%A2+Zameen.com+-+Farm+Management+Solutions%3A&oq=%E2%80%A2%09Zameen.com+-+Farm+Management+Solutions%3A&gs_lcrp=EgZjaHJvbWUyBggAEEUYOTIHCAEQIRigATIHCAMQIRigAdIBBzc5M2owajSoAgCwAgA&sourceid=chrome&ie=UTF-8#ip=1</p>
Entry-level of trainees	Intermediate
Learning Outcomes of the course	<p>By the end of this course, students will be able to:</p> <ul style="list-style-type: none"> • Perform electrical/ electronic measurement by selecting of single range with following safety precautions. • Test various electronic components using proper measuring instruments and compare the data using standard parameters. • Construct, test and verify the input/ output characteristics of various analog circuits. • Assemble, test and troubleshoot various digital circuits. • Install, configure, interconnect given computer system(s) and networking to demonstrate & utilize application packages for different applications. • Develop troubleshooting skills in various standard electronic circuits using electronic simulation software. • Apply the principle of sensors and transducers for various IoT applications. • Identify, select and test different signal conditioning and converter circuits. Check the specifications, connections, configuration and measurement of various types of sensor inputs as well as control outputs. • Identify different IoT Applications with IoT architecture. • Identify, test and interconnect components/parts of IoT system. • Identify and select various types of sensors used in Smart Agriculture. • Position the appropriate sensors and collect the information required in Smart Agriculture. • Identify, select different wireless communication modules and topology to generate and record the data. • Identify and test Wired & Wireless communication medium such as RS232, RS485, Ethernet, Fiber Optic, Wi-Fi, GSM, GPRS, RF etc. and Communication protocol. • Identify Solar Panel Basics Testing, Characteristics, Charge Controller Circuit. • Perform installation, configuration and Check working of IOT devices, network, database, app and web services.

	<ul style="list-style-type: none"> • Establish and troubleshoot IoT connectivity of devices to cloud having multiple communication medium, protocols, device management and monitoring. • Demonstrate and Deploy responsive Web Application using APIs and generate reports using templates. • Identify and install the devices used in Farm. • Monitor soil moisture, temperature etc. for controlling irrigation & record data. • Select plant health monitoring system and apply proper water, fertilizer, and pesticides. • Demonstrate an understanding of key concepts of Mobile Application Development in flutter. • Synthesize information from various sources to generate new insights. • Apply interdisciplinary approaches to problem-solving.
Course Execution Plan	<p>The total duration of the course: 3 months (12 Weeks) Class hours: 4 hours per day Theory: 20% Practical: 80% Weekly hours: 20 hours per week Total contact hours: 240 hours</p>
Companies offering jobs in the respective trade	<ol style="list-style-type: none"> 1- Research and Development Institutions 2- AgTech Startups 3- Agricultural Equipment Manufacturers 4- Government Agricultural Departments 5- Freelancing
Job Opportunities	<ul style="list-style-type: none"> • Freelance Platforms • Government Initiatives • Consulting Firms • Research Institutions
No of Students	25
Learning Place	Classroom / Lab/ Field
Instructional Resources	<ul style="list-style-type: none"> • Handbook of Research on AI-Equipped IoT Applications in High-Tech Agriculture. (2023). United States: IGI Global. • Zaman, Q. (Ed.). (2023). Precision Agriculture: Evolution, Insights and Emerging Trends. Netherlands: Elsevier • Building the Internet of Things: Implement New Business Models, Disrupt Competitors, Transform Your Industry" by Maciej Kranz • Smart Agriculture: Applications of Mobile Technologies for the Sustainable Development of Crop Production" by Muhammad Sarwar • Flutter IoT Crash Course" by Wilbert Schepenaar • "Beginning Flutter: A Hands-On Guide to App Development" by Marco L. Napoli • https://c4pa.net/

- <https://www.biz4intellia.com/blog/5-applications-of-iot-in-agriculture/>
- IoT device management**
- <https://www.techtarget.com/iotagenda/definition/internet-of-things-device-management-IoT-device-management>
- IoT Device management book**
- <https://solutionsreview.com/mobile-device-management/the-essential-iot-management-books-for-it-professionals/>
- Planning a tender response**
- <https://www.business.qld.gov.au/running-business/marketing-sales/tendering/improve-approach/tender/glossary>
 - <https://www.slideshare.net/TenderProcess/tender-process-27047746>
- Tender**
- <https://www.fool.com/the-blueprint/project-proposal/>
- Proposal writing**
- <https://www.icertglobal.com/What-is-the-Importance-of-Project-Integration-Management-to-Ensure-Project-Success/detail>
- Planning & Integration**
- <https://www.youtube.com/watch?v=s1qdDRGzK9g>

MODULES

Weeks	Module Title	Day	Hour	Learning Units	Tasks
Week 1	Introduction to Smart Agriculture and IoT, Agricultural Sensors and Data Collection, IoT Platforms and Cloud Integration, Precision Agriculture and Decision Support Systems	1	1	Overview of the course, objectives, and expectations.	Task 1,2,3
			2	Introduction to smart agriculture, Role of IoT in Agriculture	
			3	Basics of IoT: Sensors, actuators, communication protocols.	
			4	Types of sensors used in agriculture (e.g., soil, weather, crop health).	
		2	1	Sensor deployment strategies and considerations.	
			2	Basics of IoT: Sensors, actuators, communication protocols.	
			3	IoT Platform Selection, Introduction to IoT platforms for agriculture.	
			4	Cloud Integration in Agriculture, Benefits of Cloud Integration	
		3	1	Select hardware and software component.	
			2	Connecting sensors to cloud platforms.	
			3	Data acquisition and preprocessing	
			4	Data storage and security in agricultural IoT	
		4	1	Precision agriculture concepts and technologies.	
			2	IoT applications in precision farming.	
			3,4	Real-time monitoring and decision-making.	
		5	1-2	Automated farming equipment and machinery.	
3-4	Remote sensing and control of agricultural processes.				
Week 2	Advanced Electronics and Sensors Fusion	1	1-2	Introduction to sensors and transducers	Task 4
			3-4	Advanced Arduino Programming	
		2	1	Mastering Arduino IDE	Task 5
			2	Control structures	
			3	Working with Libraries	
			4	Interrupts and timers	Task 6

		3	1	Communication Protocols	Task 7	
			2	Multiple sensors fusion Ultrasonic sensor, Soil moisture sensor etc.		
			3	Wireless communication using Arduino Bluetooth, Wi-Fi module	Task 8	
			4	IoT communication protocols		
		4	1-4	Soil nutrients data collection through soil Proximal sensor using Arduino (Prototype Project)	Task 9	
		5	1-4	Smart drip Irrigation using Arduino (Prototype Project) Using Soil moisture sensor and electronic control vales	Task 10	
Week 3	Perform installation, configuration and Check working of IOT devices, network, Monitor soil moisture, temperature etc. for controlling irrigation & record data.	1	1	Install Linux Operating System porting.	Task 11 Task 12	
			2	Install Linux Operating System porting.		
			3	Install Linux Operating System porting.		
			4	Motivational Lecture (For further detail please see page no 3&4)Please download professional CV template from any good site(https://www.coolfreecv.com or relevant) for professional communication. <ul style="list-style-type: none"> • Add personal Information. • Add educational Detail. • Add experience. • Add contact detail. 		
		2	1	Configure Local cloud & server.		Task 13
			2	Configure GUI based parameter. Manage user access and security.		
			3	Installation of Visual Studio.		
			4	Python Fundamentals.		
		3	1	Introduction to Python.		Task 15
			2	Write first code in python		
			3	Installation of PostgreSQL.		

			4	Connectivity of python with PostgreSQL.	Task 16		
		4	1	Installation of PowerBI.	Task 17		
			2	PowerBI connectivity with Server.			
			3	Working of PowerBI.			
			4	Creating Dashboard and Report by using PowerBI.			
		5	1	Connectivity IOT Devices with Database.	Task 18 Task 19		
			2	Develop covering letters and dossiers for job.			
			3-4	Check Realtime data and Connectivity with PowerBI.			
W e e k 4	Automation and Control Systems, Install, configure, interconnect given computer system(s) and networking to demonstrate & utilize application packages for different applications.	1	1-2	Install solar pump, motors and drip irrigation systems.	Task 20		
			3-4	Select and Install of Soil sensors			
		2	1	IoT-enabled irrigation and fertilization systems.	Task 21		
			2	IoT-enabled irrigation and fertilization systems.			
			3	Building smart farming applications.			
			4	Building smart farming applications.			
		3	1	Plan, work in compliance with standard safety norms.	Task 22		
			2	Observe safety precaution			
			3	Follow instruction manual.			
			4	Develop a scope statement of housing project			
		4	1	Identify various benefits of application of Precision Agriculture in Smart Farming	Task 23		
			2-4	Carry out Crop and soil observations logged in the form of snapped pictures, pinpoint locations, soil colors, water, plant leaves, and light properties.			
		5	1-4	Deploy tools and test programs. Avoid e-waste and dispose the waste as per the procedure	Task 24		
		W e e k 5	Monitor soil moisture, temperature etc. for controlling irrigation & record data. Challenges, Future Trends, and Project Presentations	1	1	Success Stories	Task 25
					2-3	Measure leaf health, lighting brightness, chlorophyll amount, ripeness level, Leaf Area Index (LAI), soil organic and carbon makeup by using Smartphone Camera.	
					4	Perform predictive maintenance of machinery using Microphone.	
2	1			Apply Precision irrigation through water management in precision agriculture.	Task 26		
	1-2			Apply various Precision Agriculture tools.			
	3-4			Identify various benefits of application of Precision Agriculture in Smart Farming.			

		3	1-4	Challenges and potential risks in implementing IoT in agriculture.	Task 27
		4	1	Future trends and emerging technologies.	Task 28
	2		Future trends and emerging technologies.		
	3-4		Reflection on the course and its impact on modern agriculture.		
		5	1-2	Final project presentations by students.	
			3-4	Final project presentations by students.	
Week 6	Midterm				
Week 7	Introduction to Smart IoT App Development in Flutter	1	1	Course introduction, objectives, and expectations.	Task 29
			2	Course introduction, objectives, and expectations.	
			3	Course introduction, objectives, and expectations.	
			4	Course introduction, objectives, and expectations.	
		2	1	Introduction to Flutter framework for app development.	
			2	Introduction to Flutter framework for app development.	
			3	Introduction to Flutter framework for app development.	
			4	Introduction to Flutter framework for app development.	
		3	1	Setting up Flutter development environment.	Task 30
			2	Setting up Flutter development environment.	
			3	Setting up Flutter development environment.	
			4	Setting up Flutter development environment.	
		4	1	Basics of Dart programming language (used in Flutter).	Task 31
			2	Basics of Dart programming language (used in Flutter).	
			3	Basics of Dart programming language (used in Flutter).	
			4	Basics of Dart programming language (used in Flutter).	
		5	1	Creating a simple "Hello World" app.	

			2	Creating a simple "Hello World" app.	
			3	Creating a simple "Hello World" app.	
			4	Creating a simple "Hello World" app.	Task 32
W e e k 8	Introduction to Smart IoT App Development in Flutter	1	1-2	Understanding Flutter widgets and layouts.	Task 33
			3	Understanding Flutter widgets and layouts.	
			4	Understanding Flutter widgets and layouts.	
		2	1	Design principles for agriculture applications.	
			2	Design principles for agriculture applications.	
			3	Building responsive user interfaces.	
			4	Building responsive user interfaces.	
		3	1	Implementing custom UI elements for agricultural data visualization.	Task 34
			2	Implementing custom UI elements for agricultural data visualization.	
			3	Implementing custom UI elements for agricultural data visualization.	
			4	Implementing custom UI elements for agricultural data visualization.	
		4	1	Implementing custom UI elements for agricultural data visualization.	
			2	Implementing custom UI elements for agricultural data visualization.	
			3	Implementing custom UI elements for agricultural data visualization.	
			4	Implementing custom UI elements for agricultural data visualization.	
		5	1	Styling and theming Flutter applications for a modern look.	Task 35
2	Styling and theming Flutter applications for a modern look.				
3	Styling and theming Flutter applications for a modern look.				
4	Styling and theming Flutter applications for a modern look.				
W e e k 9	Integration of IoT and Sensors	1	1	Overview of IoT in agriculture.	Task 36
			2-3	Introduction to sensor data integration in Flutter.	
			4	Introduction to sensor data integration in Flutter.	
		2	1	Connecting Flutter app with IoT devices and sensors.	

			2	Connecting Flutter app with IoT devices and sensors.	
			3-4	Connecting Flutter app with IoT devices and sensors.	
		3	1	Connecting Flutter app with IoT devices and sensors.	Task 37
			2	Connecting Flutter app with IoT devices and sensors.	
			3-4	Connecting Flutter app with IoT devices and sensors.	
		4	1	Connecting Flutter app with IoT devices and sensors.	Task 38
			2	Connecting Flutter app with IoT devices and sensors.	
			3-4	Connecting Flutter app with IoT devices and sensors.	Task 39
		5	1	Handling real-time data updates in the app.	Task 40
			2	Handling real-time data updates in the app.	
			3-4	Handling real-time data updates in the app.	
		Week 10	Cloud Integration and Data Management, Implementing Automation Features	1	1
2	Introduction to cloud services for agriculture apps.				
3-4	Setting up cloud storage for app data.				
2	1			Integrating Firebase or another cloud service with the Flutter app.	Task 42
	2			Integrating Firebase or another cloud service with the Flutter app.	
	3-4			Integrating Firebase or another cloud service with the Flutter app.	
3	1			Understanding automation needs in agriculture.	Task 43
	2			Understanding automation needs in agriculture.	
	3			Integrating control systems with Flutter.	
	4			Integrating control systems with Flutter.	
4	1			Implementing automation features in the app.	Task 44
	2			Implementing automation features in the app.	

			3	Implementing automation features in the app.	
			4	Implementing automation features in the app.	
		5	1	Testing and debugging automation	Task 45
			2	Testing and debugging automation	
			3-4	Testing and debugging automation	
W e e k 1 1	Deployment, Testing, and Project Presentations	1	1-4	Deploying Flutter apps to different platforms (iOS, Android).	Task 46
		2	1-4	App testing and debugging.	Task 47
		3	1-4	Finalizing projects and conducting code reviews.	
		4	1-4	Final project presentations by students.	
		5	1-4	Course wrap-up and feedback.	
W e e k 1 2	Final Exams(Task 48-52)				
	<p>Task-48: As IoT devices collect vast amounts of data in agriculture, what measures and protocols should be implemented to ensure the security and privacy of farmers' data, and how can the industry address potential concerns?</p> <p>Task-49: In the context of agriculture in developing regions, how can IoT technologies be made scalable and accessible to small-scale farmers, and what challenges need to be addressed to ensure widespread adoption of smart farming practices?</p> <p>Task-50: Create a simple Flutter app with a splash screen and two screens. The first screen should have a button that navigates to the second screen. Implement basic UI elements like text and images.</p> <p>Task-51: Build an app that fetches data from a RESTful API. Display the fetched data in a list view.</p> <p>Task-52: Create a custom widget library for reusable UI components. Implement at least three custom widgets, such as a custom button, card, and form field. Utilize these widgets in your app.</p>				

Tasks for Certificate in Smart IoT Technologies in Agriculture

Task No	Task	Description	Week
1.	Internet of Things (IoT)	Develop a list on uses of IoT.	Week 1
2.	<ul style="list-style-type: none"> • Sensors • Actuators • Communication Networks 	<ul style="list-style-type: none"> • Sensors: These devices collect data on various parameters such as soil moisture, temperature, humidity, crop health, and weather conditions. • Actuators: Devices that enable automated actions based on data received from sensors, such as irrigation systems or pest control mechanisms. • Communication Networks: Facilitate the transfer of data between devices, often using wireless technologies 	
3.	Types of Agricultural Sensors	Generate a list which type of sensors used in agriculture.	
4.	Advanced Programming	Interface ultrasonic sensor with Arduino and control electronic valve at various distance values.	Week 2
5.	Arduino Libraries	Installation and working with libraries.	
6.	Interrupts and timers lab Arduino	LED blinking using Interrupts.	
7.	Multiple sensor fusion	Use soil multiple soil moisture sensor for multiple drips irrigation.	
8.	Arduino wireless communication	Interface Bluetooth module with Arduino. Interface Wi-Fi module with Arduino.	
9.	Interfacing soil proximal sensor	Interface soil proximal sensor (JXCT) to calculate soil nutrients data using Arduino.	
10.	Smart Irrigation project	Use Arduino to control drip irrigation through soil moisture sensor.	
11.	Curriculum Vita	Develop a CV for professional communication.(Please download professional CV template from any good site(https://www.coolfreecv.com or relevant) for professional communication. <ul style="list-style-type: none"> • Add a personal Information. • Add educational Detail. • Add experience. Add contact detail.)	
12.	Configure GUI based parameter	Determine the platform or system to configure user access and security. This could be an operating system, a web application, a database, or another type of system.	
13.	Installation of Visual Studio.	Install the software on your Laptop/PC.	
14.	Python Fundamentals	Generate a report by user input, data types, loops, dictionaries, and basic arithmetic operations by using python.	
15.	Python code	Calculate Average Grade by using python.	

16.	Installation of PostgreSQL	Install the software on your Laptop/PC.	
17.	Installation of PowerBI Software	Install the software on your Laptop/PC.	
18.	Covering Letters	Develop covering letters and dossiers for job.	
19.	Database Connectivity	Develop a connection between your Database and PowerBI software	
20.	Soil Sensors	<i>Choose appropriate modules of soil sensor for a task of soil sampling in a specific area</i>	Week 4
21.	Smart Farming App	<i>Develop a report indicating basic features of Smart Farming application</i>	
22.	Safety Precaution	Prepare a report on what safety precaution parameters are import for Smart Farming.	
23.	Carry out Crop and soil observations logged	<i>Develop a report Carry out Crop and soil observations logged</i>	
24.	E-waste	<i>Develop a report how to manage the E-Waste.</i>	
25.	maintenance of machinery	Develop initiation maintenance of machinery using Microphone	Week 5
26.	Precision Agriculture in Smart Farming	Develop a report having benefits of application of Precision Agriculture in Smart Farming	
27.	Risks in implementing IoT	List the challenges and potential risks in implementing IoT in agriculture	
28.	Emerging Technologies	Develop a report having future trends and emerging technologies.	
29.	Smart IoT App	Develop a report regarding App Development Requirements.	Week 7
30.	Smart IoT Flutter App development	Setting up Flutter development environment.	
31.	Dart programming	Develop a report having basic requirements regarding Dart programming language (used in Flutter).	
32.	Dart programming	Creating a simple "Hello World" app.	
33.	Flutter App Layout	Develop an understanding Flutter widgets and layouts.	Week 8
34.	Smart IoT App Development in Flutter	Implementing custom UI elements for agricultural data visualization.	
35.	Smart IoT App Development in Flutter	Styling and theming Flutter applications for a modern look.	
36.	Integration of IoT and Sensors	Develop a report regarding sensor data integration in Flutter.	Week 9
37.	Connecting Flutter app with IoT devices	Connecting Flutter app with IoT devices.	

38.	Connecting Flutter app with IoT sensors	Connecting Flutter app with IoT sensors.	
39.	Connecting Flutter app with IoT devices and sensors.	Develop a report regarding connecting Flutter app with IoT devices and sensors.	
40.	Connectivity Cloud Storage with App	Setting up cloud storage for app data.	Week 10
41.	Cloud Integration and Data Management, Implementing Automation Features	Integrating Firebase or another cloud service with the Flutter app.	
42.	Automation needs in agriculture	Develop a report regarding automation needs in agriculture.	
43.	Implementing automation features in the app	Develop a report regarding Implementing automation features in the app.	
44.	Testing and debugging automation	Test and Debug the automation app	
45.	Deploying Flutter app	Deploying Flutter apps to different platforms (iOS, Android)	Week 11
46.	Apps Testing and debugging	App testing and debugging.	
47.	Code reviews	Finalizing projects and conducting code reviews.	

Motivational Lectures and Smart IoT Technologies for Agriculture

What Is the Role of Good Manners in the Workplace? By Qasim Ali Shah | In Urdu

<https://www.youtube.com/watch?v=Qi6Xn7yKIIQ>

Hisham Sarwar Motivational Story | Pakistani Freelancer

<https://www.youtube.com/watch?v=CHm BH7xAXk>

Sample of Tenders

<https://www.business.qld.gov.au/running-business/marketing-sales/tendering/improve-approach/capability/response>

<https://www.business.qld.gov.au/running-business/marketing-sales/tendering/improve-approach/tender/glossary>

<https://www.slideshare.net/TenderProcess/tender-process-27047746>

Proposal writing

<https://www.fool.com/the-blueprint/project-proposal/>

<https://www.icertglobal.com/What-is-the-Importance-of-Project-Integration-Management-to-Ensure-Project-Success/detail>

Planning & Integration

<https://www.youtube.com/watch?v=s1qdDRGzK9g>

Annexure-III

SUGGESTIVE FORMAT AND SEQUENCE ORDER OF MOTIVATIONAL LECTURE.

Mentor

Mentors are provided an observation checklist form to evaluate and share their observational feedback on how students within each team engage and collaborate in a learning environment. The checklist is provided at two different points: Once towards the end of the course. The checklists are an opportunity for mentors to share their unique perspective on group dynamics based on various team activities, gameplay sessions, pitch preparation, and other sessions, giving insights on the nature of communication and teamwork taking place and how both learning outcomes and the student experience can be improved in the future.

Session- 1 (Communication):

Please find below an overview of the activities taking place Session plan that will support your delivery and an overview of this session's activity.

Session- 1 OVERVIEW
Aims and Objectives:
<ul style="list-style-type: none"> • To introduce the communication skills and how it will work. • Get to know mentor and team - build rapport and develop a strong sense of a team. • Provide an introduction to communication skills. • Team to collaborate on an activity sheet developing their communication, teamwork, and problem-solving. • Gain an understanding of participants' own communication skills rating at the start of the program

Activity:	Participant Time	Teacher Time	Mentor Time
Intro Attend and contribute to the scheduled.			
Understand good communication skills and how it works.			
Understand what good communication skills mean			
Understand what skills are important for good communication skills			
Key learning outcomes:	Resources:		Enterprise skills developed:
• Understand the	• Podium		• Communication

<p>communication skills and how it works.</p> <ul style="list-style-type: none"> • Understand what communication skills mean. • Understand what skills are important for communication skills 	<ul style="list-style-type: none"> • Projector • Computer • Flip Chart • Marker 	<ul style="list-style-type: none"> • Self Confidence • Teamwork
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Schedule	Mentor Should do
<p>Welcome: 5 min</p>	<p>Short welcome and ask the Mentor to introduce him/herself. Provide a brief welcome to the qualification for the class. Note for Instructor: Throughout this session, please monitor the session to ensure nothing inappropriate is being happened.</p>
<p>Icebreaker: 10 min</p>	<p>Start your session by delivering an icebreaker, this will enable you and your team to start to build rapport and create a team presentation for the tasks ahead. The icebreaker below should work well at introductions and encouraging communication, but feel free to use others if you think they are more appropriate. It is important to encourage young people to get to know each other and build strong team links during the first hour; this will help to increase their motivation and communication throughout the sessions.</p>
<p>Introduction & Onboarding: 20mins</p>	<p>Provide a brief introduction of the qualification to the class and play the “Onboarding Video or Presentation”. In your introduction cover the following:</p> <ol style="list-style-type: none"> 1. Explanation of the program and structure. (Kamyab jawan Program) 2. How you will use your communication skills in your professional life. 3. Key contacts and key information – e.g. role of teacher, mentor, and SEED. Policies and procedures (user agreements and “contact us” section). Everyone to go to the Group Rules tab at the top of their screen, read out the rules, and ask everyone to verbally agree. Ensure that the consequences are clear for using the platform outside of hours. (9am-8pm) 4. What is up next for the next 2 weeks ahead so young people know what to expect (see pages 5-7 for an overview of the challenge). Allow young people to ask any questions about the session topic.
<p>Team Activity Planning: 30 minutes</p>	<p>MENTOR: Explain to the whole team that you will now be planning how to collaborate for the first and second collaborative Team Activities that will take place outside of the session. There will not be another session until the next</p>

	<p>session so this step is required because communicating and making decisions outside of a session requires a different strategy that must be agreed upon so that everyone knows what they are doing for this activity and how.</p> <ul style="list-style-type: none"> • “IDENTIFY ENTREPRENEURS” TEAM ACTIVITY • “BRAINSTORMING SOCIAL PROBLEMS” TEAM ACTIVITY” <p><i>As a team, collaborate on a creative brainstorm on social problems in your community. Vote on the areas you feel most passionate about as a team, then write down what change you would like to see happen.</i></p> <p>Make sure the teams have the opportunity to talk about how they want to work as a team through the activities e.g. when they want to complete the activities, how to communicate, the role of the project manager, etc. Make sure you allocate each young person a specific week that they are the project manager for the weekly activities and make a note of this. Type up notes for their strategy if this is helpful - it can be included underneath the Team Contract.</p>
<p>Session Close: 5 minutes</p>	<p>MENTOR: Close the session with the opportunity for anyone to ask any remaining questions.</p> <p>Instructor: Facilitate the wrap-up of the session. A quick reminder of what is coming up next and when the next session will be.</p>

MOTIVATIONAL LECTURES LINKS.

TOPIC	SPEAKER	LINK
IoT in Agriculture	M. Farooq Tariq	https://www.youtube.com/watch?v=-fI3-dx5mV4&ab_channel=MeriZameen
How can farmers in Pakistan benefit from subsidies	M. Farooq Tariq	https://www.youtube.com/watch?v=C35QmID7-o&ab_channel=MeriZameen
How to Face Problems In Life	Qasim Ali Shah	https://www.youtube.com/watch?v=OrQte08MI90
Just Control Your Emotions	Qasim Ali Shah	https://www.youtube.com/watch?v=JzFs_yJt-w
How to Communicate Effectively	Qasim Ali Shah	https://www.youtube.com/watch?v=PhHAQEGehKc
Your ATTITUDE is Everything	Tony Robbins Les Brown David Goggins Jocko Willink Wayne Dyer Eckart Tolle	https://www.youtube.com/watch?v=5fS3rj6elFg
Control Your EMOTIONS	Jim Rohn Les Brown TD Jakes Tony Robbins	https://www.youtube.com/watch?v=chn86sH005U
Defeat Fear, Build Confidence	Shaykh Atif Ahmed	https://www.youtube.com/watch?v=s10dzfbozd4
Wisdom of the Eagle	Learn Kurooji	https://www.youtube.com/watch?v=bEU7V5rJttw
The Power of ATTITUDE	Titan Man	https://www.youtube.com/watch?v=r8LJ5X2ejqU
STOP WASTING TIME	Arnold Schwarzenegger	https://www.youtube.com/watch?v=kzSBrJmXqdg
Risk of Success	Denzel Washington	https://www.youtube.com/watch?v=tbnzAVRZ9Xc

S. No	Key Information	Detail/Description
1.	Self & Family background	Ali Khan , an agricultural technologist based in Lahore, Pakistan, embarked on a journey to leverage Smart IoT Technologies for Agriculture. Recognizing the challenges faced by local farmers, he founded a startup called "AgroTech Innovations" in 2018. The company focused on developing affordable and user-friendly IoT solutions tailored to the needs of small-scale farmers in Pakistan
2.	Post-training activities	AgroTech Innovations introduced a range of IoT devices, including soil moisture sensors, weather stations, and crop monitoring cameras. These devices were designed to provide real-time data to farmers, helping them make informed decisions about irrigation, pest control, and crop management. Ali Khan's success story exemplifies how individuals with a passion for agriculture and technology can make a positive impact by leveraging Smart IoT Technologies to address the unique challenges faced by farmers in Pakistan.
3.	Message to others (under training)	Take the training opportunity seriously Impose self-discipline and ensure regularity. Make Hard work pays in the end so be always ready for the same.

Note: Success story is a source of motivation for the trainees and can be presented in several ways/forms in a NAVTTC skill development course as under: -

1. To call a passed out successful trainee of the institute. He will narrate his success story to the trainees in his own words and meet trainees as well.
2. To see and listen to a recorded video/clip (5 to 7 minutes) showing a successful trainee Audio-video recording that has to cover the above-mentioned points.*

3. The teacher displays the picture of a successful trainee (name, trade, institute, organization, job, earning, etc.) and narrates his/her story in the teacher's own motivational words.

** The online success stories of renowned professional can also be obtained from **Annex-II***

Workplace/Institute Ethics Guide

Work ethic is a standard of conduct and values for job performance. The modern definition of what constitutes good work ethics often varies. Different businesses have different expectations. Work ethic is a belief that hard work and diligence have a moral benefit and an inherent ability, virtue, or value to strengthen character and individual abilities. It is a set of values-centered on the importance of work and manifested by determination or desire to work hard.

The following ten work ethics are defined as essential for student success:

1. Attendance:

Be at work every day possible, plan your absences don't abuse leave time. Be punctual every day.

2. Character:

Honesty is the single most important factor having a direct bearing on the final success of an individual, corporation, or product. Complete assigned tasks correctly and promptly. Look to improve your skills.

3. Team Work:

The ability to get along with others including those you don't necessarily like. The ability to carry your weight and help others who are struggling. Recognize when to speak up with an idea and when to compromise by blend ideas together.

4. Appearance:

Dress for success set your best foot forward, personal hygiene, good manner, remember that the first impression of who you are can last a lifetime

5. Attitude:

Listen to suggestions and be positive, accept responsibility. If you make a mistake, admit it. Values workplace safety rules and precautions for personal and co-worker safety. Avoids unnecessary risks. Willing to learn new processes, systems, and procedures in light of changing responsibilities.

6. Productivity:

Do the work correctly, quality and timelines are prized. Get along with fellows, cooperation is the key to productivity. Help out whenever asked, do extra without being asked. Take pride in your work, do things the best you know-how. Eagerly focuses energy on accomplishing tasks, also referred to as demonstrating ownership. Takes pride in work.

7. Organizational Skills:

Make an effort to improve, learn ways to better yourself. Time management; utilize time and resources to get the most out of both. Take an appropriate approach to social interactions at work. Maintains focus on work responsibilities.

8. Communication:

Written communication, being able to correctly write reports and memos.
Verbal communications, being able to communicate one on one or to a group.

9. Cooperation:

Follow institute rules and regulations, learn and follow expectations. Get along with fellows, cooperation is the key to productivity. Able to welcome and adapt to changing work situations and the application of new or different skills.

10. Respect:

Work hard, work to the best of your ability. Carry out orders, do what's asked the first time. Show respect, accept, and acknowledge an individual's talents and knowledge. Respects diversity in the workplace, including showing due respect for different perspectives, opinions, and suggestions.