Course Details / Description & Preliminaries

Course Title	Internet of Things(IoT) System Development & Applications
Objectives and Expectations	**Employable skills through an intensive course on Internet of Things (IoT)** This is a special course designed to address unemployment in the youth. The course aims to achieve the above objective through hands on practical training delivery by a team of dedicated professionals having rich market/work experience. This course is therefore not just for developing a theoretical understanding/back ground of the trainees. Contrary to that it is primarily aimed at equipping the trainees to perform commercially in a market space in independent capacity or as a member of a team. The course therefore is designed to impart not only technical skills but also soft skills (i.e. interpersonal/communication skills; personal grooming of the trainees etc) as well as entrepreneurial skills (i.e marketing skills; free lancing etc). The course also seeks to inculcate work ethics to foster better citizenship in general and improve the image of Pakistani work force in particular. **Main Expectations:** In short, the course under reference should be delivered by professional instructors in such a robust hands- on manner that the trainees are comfortably able to employ their skills for earning money (through wage/self-employment) at its conclusion. 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.
Key Features of Training& Special Modules	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 (2nd & 3rd 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 favoured labour 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 **Work Place 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.

In order to maintain interest and motivation of the trainees throughout the course, modern techniques such as:

- Success Stories,
- Motivational Lectures
- Case Studies

These techniques would be employed as an additional training tool wherever possible (these are 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 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

Training Tools/ Methodology	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 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. **(ii) Success Stories**

Another effective way of motivating the trainees is by means of Success Stories. Its inclusion in the weekly lesson plan at regular intervals has been recommended till the end of the training.

A success story may be disseminated orally, through a presentation or by means of a video/documentary of someone that has risen to fortune, acclaim, or brilliant achievement. A success story shows how a person achieved his goal through hard work, dedication and devotion. An inspiring success story contains compelling and significant facts articulated clearly and easily comprehendible words. Moreover, it is helpful if it is assumed that the reader/listener knows nothing of what is being revealed. Optimum impact is created when the story is revealed in the form of:-

- Directly in person (At least 2-3 cases must be arranged by the training institute)
- Through an audio/ videotaped message (2-3 high quality videos must be arranged by the training institute)

It is expected that the training provider would collect relevant high quality success stories for inclusion in the training as suggested in the weekly lesson plan given in this document.

Suggestive structure and sequence of a sample success story and its various shapes can be seen at annexure III.

(iii)   Case Studies

Where a situation allows, case studies can also be presented to the trainees to widen their understanding of the real life specific problem/situation and to explore the solutions.

In simple terms, the case study method of teaching uses a real life case example/a typical case to demonstrate a phenomenon in action and explain theoretical as well as practical aspects of the knowledge related to the same. It is an effective way to help the trainees comprehend in depth both the theoretical and practical aspects of the

complex phenomenon in depth with ease. Case teaching can also stimulate the trainees to participate in discussions and thereby boost their confidence. It also makes class room atmosphere interesting thus maintaining the trainee interest in training till the end of the course.

Depending on suitability to the trade, the weekly lesson plan in this document may suggest case studies to be presented to the trainees. The trainer may adopt a power point presentation or video format for such case studies whichever is deemed suitable but it's important that only those cases are selected that are relevant and of a learning value. The Trainees should be required and supervised to carefully analyze the cases.

For the purpose they must be encouraged to inquire and collect specific information / data, actively participate in the discussions and intended solutions of the problem / situation.

Case studies can be implemented in the following ways: -

i.   A good quality trade specific documentary (At least 2-3 documentaries must be arranged by the training institute)

ii.   Health &Safety case studies (2 cases regarding safety and industrial accidents must be arranged by the training institute)

iii.   Field visits(At least one visit to a trade specific major industry/ site must be arranged by the training institute)

Learning Outcome of the Course	After completion of this course, the trainees must be able to do: • Planning, coding and designing alternative solutions in the field. • Finding problems with secure, robust and even cost effective IoT Solutions. • Understand key concepts and components that make IoT system. • Enabling key technologies and protocols that enable IoT system. • Working on different devices such as Raspberry Pi, Arduino and sensory data acquisition to make a complete IoT system.

	• Understand where IoT fits in international and local ICT industry and its future trends.
Entry level of trainees	Since intake level is Bachelor of Computer Science (BCS) / B.Sc (Computer Science) so expectations of the trainees are: • Have knowledge of Programming Concepts • Have studied languages such as C, C++, JAVA,C#.net • Have concept of Computer system
Course Execution Plan	Total Duration of Course: 6 Months (26 Weeks)
	Class Hours: 4 Hours per day (06 Days/Week)
	Theory: 20% Practical: 80%
	Weekly Hours: 24 Hours Per week
	Total Contact Hours: 600 Hours
Companies Offering Jobs in the respective trade	• Free Lancing International Companies:- • Google • Intel • Microsoft • Cisco • Apple • Samsung • Sky bell • Mymdband • Deaco • Many more Besides overseas employment, the following Pakistani companies/firms/Organizations are also offering jobs as well, with details as under:-

	• CISNR
	• NCAI
	• NCRC
	• NIDA
	• EWall
	• Arduino Pak
	• PLC
	• SDSol Technologies
	• IoT developers systems Limited, Lahore
	• DPL Islamabad
	• Sync & Secure, Lahore
	• Cross Analytics, Islamabad
	• SDSol Technologies
	• Digital Dividend
	• Technosoft Solutions
	• Datum Brain
	• Internet of Things and Automation Pakistan Pvt. Ltd
Job Opportunities	The participants may be able to:- • Develop their own IoT based solutions. • Transform daily life applications to IoT solutions. • Produce research ideas to develop systems for automation, security and surveillance. • Find employability in international market/ research centers. • Produce industrial grade IoT products and increase entrepreneurship.
No of Students	25
Learning Place	Classroom / Lab / Site

WEEKLY SCHEDULE OF TRAINING

Scheduled Week	Module Title	Learning Units	Remarks
Week 1	**Introduction to IoT and IoT Devices**	• Course Introduction • Motivational Lecture • Applications of IoT • Job Market Overview • Recognizing IoT Instruments • IoT Measuring Instruments • IoT Smart Applications • IoT Power System Appliances • IoT Power Conditioning • Testing Benches for IoT • Debugging IoT Devices • Microcontroller-based IoT Data Processing • Overview of 8-bit Microcontrollers • Arduino Uno Development Board • Success Stories in IoT • Ethics in IoT (Please refer to Annexure-II at the end for further details)	**Home Assignment** *Details may be seen at Annexure-IV* • **Task – 1** • **Task – 2** • **Task – 3** *Details may be seen at Annexure-I* **Home Assignment** *Details may be seen at Annexure-IV*
Week 2	**Microcontroller and Arduino Programming Architecture**	• Motivational Lecture*(For further detail please see Page No: 4)* • Types of Microcontroller and introduction to MCU Programming	• **Task – 3 to 6** *Details may be seen at Annexure-I*

		• Arduino flavours, architecture, Coding and debugging • Digital input and output applications • Arduino decision making applications • Multiple repetitions and looping • Arduino latching applications • Arrays and its applications • Arduino application using arrays • Arduino Multiple inputs and outputs • Dynamic LED array Application • Motivational Lecture*(For further detail please see Page No: 4)* • Institute/Work ethics *(For further detail please see Annexure-II at the end)*	**Home Assignment** *Details may be seen at Annexure-IV*
Week 3	**Communication**	• Establishing IoT auto communication platform • Establishing IoT auto communication to LED Array • Actuators and Control devices • H Bridge applications • LORA and its applications • Success story *(For further detail please see Page No: 5 and Annexure-III at the end)*	• **Task – 7 to 9** *Details may be seen at Annexure-I*
Week 4	**Control Architecture**	• Motivational Lecture*(For further detail please see Page No: 4)* • Solid State control devices • Automatic control and switching	• **Task –10 to 12** *Details may be seen at Annexure-I*

		• LCD Displays types and applications	**Home Assignment** *Details may be seen at Annexure-IV*
		• LCD Interfacing	
		• Timers and interrupts Applications	
		• Actuators types and Applications	
		• Actuators control	
		• IoT Design Constraints	
		• Institute/Work ethics *(For further detail please see Annexure-II at the end)*	
Week 5	**Sensory Data Acquisition**	• Motivational Lecture	• **Task – 13 to 15** *Details may be seen at Annexure-I*
		• Current Sensing *(For further detail please see Page No: 4)*Methods	
		• Temperature Sensing and applications	
		• Serial data array on digital stream	**Home Assignment** *Details may be seen at Annexure-IV*
		• Light intensity sensing and applications	
		• Touch Sensor applications	
		• Level Sensors types and Applications	
		• Ultraviolet sensors	
		• Vibration Sensor Applications	• **Monthly Test 2**
		• Humidity sensor	
		• Pressure Sensor	
		• Institute/Work ethics *(For further detail please see Annexure-II at the end)*	
		• Start Freelancing	
Week 6	**Serial Data Communication**	• Motivational Lecture*(For further detail please see Page No: 4)*	• **Task – 16 to 18** *Details may be seen at Annexure-I*
		• Introduction to NodeMCU	
		• Serial Data communication	
		• IoT Communication Devices (IR)	
		• Radio Frequency Communication	
		• RF Communication Application	

		• RFID Applications • Institute/Work ethics *(For further detail please see Annexure-II at the end)*	**Home Assignment** *Details may be seen at Annexure-IV*
Week 7	**Overview of the Previous Weeks & Mid Term Examination**		
Week 8	**Standardizatio n and Security**	• IoT Design Standardization • IoT Design Standardization • IoT Standardization Applications • Security Mechanism • Security Mechanism Constraints • Success story *(For further detail please see Page No: 5 and Annexure-III at the* • Session on General Overseas Employment opportunities. • Job search Avenues. • Visa Processes and other necessary requirements. • Immigration Information (Legal age requirements, Health Certificate, Police Clearance &Travel Insurance)	• **Task – 19 to 21** *Details may be seen at Annexure-I* • **Monthly Test 3**

Week 9	**Introduction to Python Programming and Raspberry Pi**	• Introduction to Python programming	**Task –22 to 24**
		• Python programming	*Details may be seen at Annexure-I*
		• Python Looping	
		• Python Data Structure	
		• Python Functions	
		• Introduction to Raspberry pi	
		• Raspberry pi interfaces	
		• Raspberry pi Applications	
		• Raspberry Pi software (Rasbian)	
		• Success story *(For further detail please see Page No: 5 and Annexure-III at the end)*	
	Entrepreneur ship	• Session on Self-Employment • How to start a Business. • Requirements (Capital, Physical etc)	
		• Benefits/Advantages of self-employment	
		• Institute/Work ethics *(For further detail please see Annexure-II at the end)*	
Week 10	**Raspberry Pi**	• Motivational Lecture *(For further detail please see Page No: 4)*	• **Task – 25-27**
		• Basic Raspberry Pi Applications	*Details may be seen at Annexure-I*
		• Remote Access Using Raspberry Pi	
		• Using Camera with Raspberry Pi	
		• Remote Access of Camera	
		• Surveillance camera Application using Raspberry Pi	
		• Success story *(For further detail please see Page No: 5 and Annexure-III at the end)*	
		• Institute/Work ethics *(For further detail please see Annexure-II at the end)*	
		• Freelancing concepts, how to start, step by step process from account opening to taking orders and contract signing	

		• Freelancing platforms	
Week 11	**Cloud and Fog Computing**	• Motivational Lecture*(For further detail please see Page No: 4)* • Cloud Computing • FoG Computing	**Task –28 to 30** *Details may be seen at Annexure-I*

	Job Search	• Protocols • Communication Protocols • Job market & job search • Job related skills. • Interpersonal skills • Communication skills • Session on CV Building. • Selection of two countries of destination (Gulf Countries, Malaysia, South Korea etc) focusing on:- • Trade specific Job Prospects and Earning levels in that country. • Country Specific Labor laws, entry and exit requirements (Legal age requirements, Health Certificate, Police Clearance & Travel Insurance etc.). • Success story *(For further detail please see Page No: 5 and Annexure-III at the end)* • Institute/Work ethics *(For further detail* • *please see Annexure-II at the end)*	**Monthly Test 4**
Week 12	**Control, sensory data acquisition andmonitoring Applications**	• IoT application for Home Automation • IoT application for Smart Cities • Institute/Work ethics *(For further detail*	**Task –31 to 33** *Details may be seen at Annexure-I*

		please see Annexure-II at the end)	
		• Finding Your Way Around the GPIO	
		• Setting Up SPI on Raspberry Pi	
		• Powering Raspberry Pi	
		• Python on Raspberry Pi	
		• Sensory data Acquisition	
		• Sensory data Acquisition with Python	
		• Success story _(For further detail please see Page No: 5 and Annexure-III at the end)_	
Week 13-14	**Project Selection and Proposal/ Report Writing**	• Project Selection • Project Proposal Formation • Proposal / Report Writing • Project Proto-typing	

		• Project Implementation	
Week 14		• Final Project Demonstration/Examination • Final Assessment	**Final Assessment**

Tasks For IoT System Development & Applications

Task No.	Task	Description	Week No
1.	**Exploring IoT Concepts and Applications**	Gain an in-depth understanding of IoT, including its key concepts, applications, and market trends, and learn to recognize IoT instruments and their functionalities.	**Week–1**
2.	**Practical Skills with IoT Devices**	Develop hands-on skills by testing and debugging IoT devices, exploring microcontroller-based IoT data processing, and gaining proficiency with the Arduino Uno development board.	
3.	**Ethics and Success Stories in IoT**	Explore the ethical considerations of IoT while examining real-world success stories that showcase the transformative power of IoT, fostering critical thinking and ethical awareness in IoT development and deployment.	

4.	**Introduction to Microcontroller Programming**	Attend a motivational lecture and learn about different types of microcontrollers, their architecture, and programming concepts using Arduino.	
5.	**Digital Input and Output Applications with Arduino**	Explore practical applications of digital input and output, including decision-making, looping, and interfacing with sensors, to develop proficiency in Arduino programming.	**Week–2**
6.	**Arduino LED blinking**	Expand your Arduino programming skills by delving into advanced concepts such as arrays and their applications. Learn to handle multiple inputs and outputs, and engage in a dynamic LED array application, enhancing your ability to work on complex Arduino.	

7.	**Setting up IoT Auto Communication Platform**	Learn to establish an IoT auto communication platform, enabling seamless connectivity between IoT devices for efficient data exchange.	
8.	**IoT Auto Communication to LED Array**	Implement IoT auto communication to control an LED array, showcasing the capability of transmitting commands wirelessly and controlling physical outputs.	**Week-3**
9.	**Actuators, Control Devices, and LORA**	Explore the use of actuators and control devices in IoT applications, including the application of H Bridge for motor control. Additionally, gain insights into LORA communication technology and its applications in IoT.	
10.	**Understanding Control Architecture**	Attend a motivational lecture to gain insights into control architecture. Learn about solid-state control devices and their applications. Explore automatic control and switching mechanisms to enable efficient control in IoT systems.	
11.	**LCD Displays and Timers**	Explore different types of LCD displays and their applications in IoT. Learn about LCD interfacing techniques for effective data visualization. Understand the applications of timers and interrupts in IoT systems to enhance timing precision and event-driven functionality.	**Week–4**
12.	**Actuators and Design Constraints**	Study different types of actuators and their applications in IoT. Gain knowledge of actuators control methods for effective integration into IoT systems. Also, explore the design constraints specific to IoT projects and develop an understanding of institute/work ethics in IoT development.	

13.	**Inspirational Motivation**	Attend a motivational lecture to spark inspiration and enthusiasm for the field of IoT. Discover the potential and possibilities that lie within IoT applications.	
14.	**Sensing the Environment**	Gain knowledge about various sensing methods, including current sensing, temperature sensing, light intensity sensing, touch sensors, and level sensors. Understand their applications in IoT systems to collect data and enable intelligent decision-making.	**Week 5**
15.	**Exploring Sensor Technologies**	Dive into the world of sensor technologies by exploring ultraviolet sensors, vibration sensors, humidity sensors, and pressure sensors. Learn about their unique capabilities and applications in IoT systems. Additionally, explore the importance of institute/work ethics and discover opportunities to start freelancing in the IoT domain.	
16.	**Serial Data Communication and NodeMCU Introduction**	Attend a motivational lecture to boost your enthusiasm for IoT. Learn about NodeMCU, an open-source IoT platform, and its capabilities. Explore the fundamentals of serial data communication, including protocols and techniques used in IoT systems.	
17.	**IoT Communication Devices: IR and Radio Frequency**	Dive into IoT communication devices, starting with Infrared (IR) communication and its applications. Understand the principles of IR communication and how it enables data transfer in IoT systems. Explore Radio Frequency (RF) communication and its various applications, including wireless connectivity and remote control.	**Week-6**
18.	**RFID Applications and Institute/Work Ethics**	Gain knowledge about Radio Frequency Identification (RFID) technology and its applications in IoT. Learn how RFID enables object tracking, access control, and identification in various industries. Additionally, delve into the importance of institute/work ethics, ensuring responsible and ethical practices in IoT development and deployment.	

19.	**IoT Design Standardization and Applications**	Explore the importance of IoT design standardization and its impact on interoperability and scalability. Learn about existing IoT design standards and their applications in ensuring compatibility and seamless integration of IoT systems. Gain insights into the benefits and challenges associated with IoT standardization.	
20.	**Security Mechanisms in IoT**	Dive into the world of IoT security mechanisms and their significance in safeguarding IoT systems and data. Explore different security measures, including authentication, encryption, and access control, to mitigate potential threats and vulnerabilities in IoT environments. Understand the constraints and challenges in implementing effective security mechanisms in IoT systems.	**Week–8**
21.	**Overseas Employment Opportunities and Visa Processes**	Attend a session focused on general overseas employment opportunities, providing insights into job search avenues for IoT professionals. Learn about the visa processes and other necessary requirements for working abroad. Obtain immigration information, including legal age requirements, health certificate, police clearance, and travel insurance, ensuring a comprehensive understanding of the necessary procedures for international employment.	

22.	**Python Programming Fundamentals and Raspberry Pi Introduction**	Get started with Python programming by attending an introductory session. Learn the basics of Python programming, including looping, data structures, and functions. Gain an understanding of Raspberry Pi, its interfaces, and applications. Explore the Raspberry Pi software, Rasbian, and discover success stories in utilizing Python and Raspberry Pi.	
23.	**Raspberry Pi Projects and Software Applications**	Dive deeper into Raspberry Pi by exploring its various applications and project possibilities. Learn about different interfaces and their functionalities. Gain hands-on experience in developing projects using Raspberry Pi. Understand the software aspects of Raspberry Pi, including Rasbian operating system, and how to leverage it for your projects.	**Week–9**
24.	**Self-Employment and Starting a Business**	Attend a session on self-employment and entrepreneurship. Learn about the advantages and benefits of self-employment. Explore the requirements, including capital and physical resources, for starting a business. Gain insights into the institute/work ethics necessary for successful entrepreneurship. This task provides valuable information and guidance for those interested in venturing into self-employment and starting their own business.	
25.	**Exploring Raspberry Pi and Basic Applications**	Attend a motivational lecture to ignite enthusiasm for Raspberry Pi. Learn about the basic applications of Raspberry Pi, including its capabilities and potential use cases. Understand how Raspberry Pi can be utilized in various projects and gain insights into the wide range of possibilities it offers.	**Week-10**
26.	**Remote Access and Camera Integration with Raspberry Pi**	Discover how to remotely access your Raspberry Pi, enabling you to control and monitor it from anywhere. Learn how to integrate a camera with Raspberry Pi and explore the possibilities of capturing and streaming video remotely. Gain knowledge about surveillance camera applications using Raspberry Pi for security and monitoring purposes.	

| 27. | **Success Stories, Institute/Work Ethics, and Freelancing Concepts** | Explore success stories related to Raspberry Pi projects, inspiring you with real-world examples of its applications. Understand the importance of institute/work ethics in the field of IoT and Raspberry Pi development. Additionally, dive into the world of freelancing by learning about concepts, step-by-step processes, and platforms for starting your freelance journey, from opening an account to taking orders and signing contracts. | |

28.	**Cloud and Fog Computing Fundamentals**	Attend a motivational lecture that highlights the potential and significance of cloud and fog computing in the IoT landscape. Learn about cloud computing, its architecture, and how it enables scalable and flexible data storage and processing. Explore fog computing, its benefits, and how it extends the capabilities of cloud computing to the edge of the network.	
29.	**Job Search and Essential Skills Development**	Gain insights into job search strategies and techniques, focusing on IoT-related positions. Learn about communication protocols used in IoT systems and their importance in enabling seamless data exchange. Understand the job market dynamics and the skills required for IoT-related roles, including technical skills, interpersonal skills, and effective communication skills. Attend a session on building a compelling CV to showcase your qualifications and experience.	**Week–11**
30.	**International Job Opportunities and Country-specific Considerations**	Explore international job opportunities in countries like Gulf Countries, Malaysia, or South Korea. Select two destination countries and dive into trade-specific job prospects and earning levels in those countries. Understand the country-specific labor laws and entry/exit requirements, such as legal age requirements, health certificate, police clearance, and travel insurance. Discover success stories of individuals who have pursued international job opportunities. Additionally, explore the importance of ethics in the IoT industry, ensuring responsible and ethical practices in job search and professional conduct.	
31.	**Home Automation IoT Application**	Explore the world of home automation using IoT technology. Learn about the various applications and use cases of IoT in controlling and monitoring home devices and systems. Understand how to leverage IoT technologies to enhance comfort, security, and energy efficiency in residential environments.	
32.	**Smart Cities IoT Application**	Discover the potential of IoT in creating smart cities. Learn about the applications and benefits of IoT in improving urban infrastructure, transportation, energy management, and public services. Gain insights into the challenges and opportunities in implementing IoT solutions for smart cities, and explore real-world examples of successful smart city projects.	**Week-12**

33.	**GPIO Setup, SPI Configuration, and Sensory Data Acquisition**	Get hands-on experience with Raspberry Pi GPIO (General Purpose Input/Output) pins and learn how to navigate and utilize them effectively. Explore the setup and configuration of SPI (Serial Peripheral Interface) on Raspberry Pi for communication with external devices. Dive into sensory data acquisition using sensors and learn how to interface them with Raspberry Pi. Utilize Python programming to collect and process sensory data for various IoT applications.	
34.	**Project Selection**	Engage in the process of selecting a suitable project for IoT implementation. Explore different project ideas and evaluate their feasibility, scope, and potential impact. Consider factors such as resources, technical requirements, and alignment with personal interests and goals to make an informed decision.	**Week–13-14**
35.	**Project Proposal Formation**	Learn the essential elements and structure of a project proposal. Develop skills in articulating project objectives, methodology, timeline, and expected outcomes. Understand the importance of clearly defining the project scope, deliverables, and resources required. Craft a comprehensive and persuasive project proposal that effectively communicates the project's value and justifies its implementation.	
36.	**Proposal/Report Writing and Project Proto-typing**	Hone your technical writing skills to create professional and concise proposals and reports. Learn about effective writing techniques, proper formatting, and referencing standards. Develop proficiency in documenting project progress, challenges, and solutions. Engage in project prototyping, where you will implement a preliminary version of your project to test its functionality and validate its feasibility.	

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 importance of work and manifested by determination or desire to work hard.

The following ten work ethic 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 own weight and help others who are struggling. Recognize when to speak up with an ideas 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 life time

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. Takes 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 workplace situations and the application of new or different skills.

10. **Respect:**

    Work hard, work to 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.

Suggestive Format and Sequence Order of Success Story

S. No	Key Information	Detail/Description
1.	**Self & Family background**	• Self-introduction • Family background and socio economic status, • Education level and activities involved in • Financial hardships etc
2.	**How he came on board NAVTTC Training/ or got trained through any other source**	• Information about course, apply and selection • Course duration, trade selection • Attendance, active participation, monthly tests, interest in lab work
3.	**Post training activities**	• How job / business (self-employment) was set up • How capital was managed (loan (if any) etc). • Detail of work to share i.e. where is job or business being done; how many people employed (in case of self-employment/ business) • Monthly income or earnings and support to family • Earning a happy life than before
4.	**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 a number of ways/forms in a NAVTTC skill development course as under:-

1. **To call a passed out successful person of institute. He/she will narrate his/her success story to the trainees in his/her own words and meet trainees as well.**

2. **To see and listen to a recorded video/clip (5 to 7 minutes) showing a successful person 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 per month etc) and narrates his/her story in teacher's own motivational words.**

Home Assignment

Designing Effective Homework

To achieve a positive impact on student learning, homework assignments must be well-designed and carefully constructed. Some specific research findings include:

- ► Homework is most effective when it covers material already taught.
- ► Homework is most effective when it is used to reinforce skills learned in previous weeks or months.
- ► Homework is less effective if it is used to teach complex skills.

Characteristics of Good Assignments

When teachers plan homework, they should consider the characteristics listed below:

- ► Provide clear instructions for students;
- ► Can be completed successfully;
- ► Are not too long;
- ► Can be completed within a flexible time frame;
- ► Use information and materials that are readily available;
- ► Reinforce and allow practice of previously taught skills;
- ► Must not be unfinished class work;
- ► Are interesting to students and lead to further exploration and study;
- ► Stimulate creativity and imagination in the application of skills;
- ► Stimulate home and class discussion

Homework Don'ts

Do not assign homework that:

- ► Is unfamiliar, boring or impossible to do
- ► Requires complex skills or requires unreasonable time frames
- ► Is a "time filler" to keep students busy or a punishment for not doing class work
- ► Do not wait until the last minute to organize and assign the *homework (You may give useless or impossible tasks and/or giving inadequate directions)*
- ► Do not assume that all homes have equal resources, that all parents have equal skills and talents to support their children as learners
- ► Do not collect any homework you do not intend to check, review or grade.
- ► Do not assign homework that is so difficult and unfamiliar to students that their parents are tempted to:
  - Do the work for them;
  - Accuse their children of being inattentive in class; or
  - Accuse their children of failing.

References

1. A Union of Professionals, Classroom Tips, Assigning Effective Homework https://files.eric.ed.gov/fulltext/ED516934.pdf visited on 7th June, 2020