

Government of Pakistan

National Vocational and Technical Training Commission

Prime Minister's Hunarmand Pakistan Program

"Skills for All"



Course Contents/ Lesson Plan

Course Title: Renewable Energy System Design (Solar & Biomass)

Duration: 6 Months

Revised Edition

Trainer Name	
Course Title	Renewable Energy System Design (Solar & Biomass)
Objectives and Expectations	<p>Employable skills and hands on practice for Renewable Energy System Design (Solar & Wind)</p> <p>Course provides an opportunity to build a great career in the field of renewable energy system design, course start from basic level and then move towards the advance level. Starting from introduction of renewable system then move towards design of solar energy system and application and installation of this solar energy system. This course will cover the different renewable energy system likewise solar energy, wind energy, biogas energy and geothermal energy and then finally some introduction to the Tidal Power Energy System.</p> <p><u>Main Expectations:</u></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, where's hands on practice are not valid than demonstration will be required through video contents/ project prototype.</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> <ol style="list-style-type: none">1. 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.

2. 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 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.
3. 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.

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

- Motivational Lectures
- Success Stories
- 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.

1. 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:

1. Clear Purpose to convey message to trainees effectively.
2. Personal Story to quote as an example to follow.
3. Trainees Fit so that the situation is actionable by trainees and not represent a just idealism.
4. 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.

5. 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 comprehensible 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:-

1. Directly in person (At least 2-3 cases must be arranged by the training institute)
2. 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.

3. 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 classroom 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: -

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

	<p>2. Health & Safety case studies (2 cases regarding safety and industrial accidents must be arranged by the training institute)</p> <p>Field visits (At least one visit to a trade specific major industry/ site must be arranged by the training institute)</p>
<p>Entry level of trainees</p>	<p>Since intake level is FA/FSC/DAE/Electrician, the expectations from the trainees are:</p> <ul style="list-style-type: none"> • To have knowledge of Electrical Wiring, Power Back System • Knowledge of Renewable Energy <p>To have concept of renewable energy software's for power calculation and designing</p>
<p>Learning Outcomes of the course</p>	<p><u>By the end of this course, the trainees should be able to perform the following competencies:</u></p> <p>Renewable energy and Sustainable development</p> <ul style="list-style-type: none"> • Understand the concept of Sustainable Energy Development • Demonstrate different type of Renewable Energy Technologies • Demonstrate salient feature of renewable energy • Utilize the natural Energy in building • Calculate Power tariff and compare power tariff • Analyze various parameter of energy efficiency management and energy Conservation • Demonstrate Power backup systems <p><u>Solar Power System</u></p> <ul style="list-style-type: none"> • Demonstrate Solar power system and its characteristics • Different types of Solar PV system (On-Grid, Off-Grid, Hybrid systems) • Identify Solar System components (Solar PV Panel, Battery, Charge controller, stand for solar PV panel, wire for solar system, reverse meeting) • Identify various type of solar panel and their characteristics • Identify various type of battery and their characteristics

- Identify various type of charge controller and their characteristics
- Identify type of wire for solar system and their characteristics
- Calculate load for solar system as per demand through software and manual
- Design solar system as per load demand
- Select components for solar system
- Select angle /view for solar system
- Install Solar system
- Operate solar system
- Repair and maintain solar system
- Install reverse/net metering system

Solar DC Water pumping system.

- Design Solar DC water pumping system as per customer demand
- Select components for designing
- Install solar DC water pump
- Operate Install solar DC water pump
- Repair and maintain solar DC water pump

Solar water heating system.

- Demonstrate Solar water heating system.
- Select solar water Heating system as per customer demand
- Install solar water Heating system
- Repair and maintain solar water heating system
- Operate and service of solar water heating system
- Define wind energy and its characteristics

Biomass Energy System

- Components of biogas plant
- Factors that affect the performance of biogas plant
- System design and installation
- Biodiesel
- Electricity Production

Job Searching

- Analyze job in local market

	<ul style="list-style-type: none"> • CV building as per job demand • Analyze job demand in any two-international country • Jobs Applying procedure in any two-international country <p>Entrepreneurship</p> <ul style="list-style-type: none"> • Analyze customer demand • Perform cost analysis of customer demand • Conduct market survey for project estimation • Prepare quotation for customer • Negotiate with customer • Deal with customer and signed MOU • Prepare quotations/ invoice report • Complete the Work done on site <p>Soft skills /Teamwork/professionalism</p> <ul style="list-style-type: none"> • Develop professionalism • Motivational Lectures • Success Stories • Develop work ethics • Follow teamwork environments principals • Ensure punctuality of time • Ensure job deliverable within assigned time frame • Show dedication and commitment with your duty • Be creative in your work • Ensure positive attitude in group task • Ensure willing worker attitude in teamwork • Be goal oriented • Ensure HSE SOPs • Obey organizational rules and regulations • Be loyal with your duty and organization • Honesty is best policy
Course Execution Plan	<p>Total duration of course:6 months (26 Weeks)</p> <p>Class hours:4 hours per day</p>

	<p>Theory: 20%</p> <p>Practical: 80%</p> <p>Weekly hours: 20 hours per week</p> <p>Total contact hours: 520hours</p>
Companies offering jobs in the respective trade	<ol style="list-style-type: none"> 1. Power Sector 2. Industrial Sector 3. Offices
Job Opportunities/job titles	<ul style="list-style-type: none"> • Solar Energy system installer/operator/ designer. • Solar DC water Pump installer/operator/ designer. • Wind Power Plant installer/operator/ designer. • Solar heating system installer/operator/ designer. • Biomass Energy system designer. installer/operator/ designer. • Solar and wind power plant installer/operator/ designer. • Repair and maintenance of renewable energy projects.
No of Students	25
Learning Place	Classroom / Lab
Instructional Resources	

MODULES

Scheduled Weeks	Module Title	Learning Units	Remarks
Week 1	<p>Sustainable/Renewable Energy Development</p> <p>Different type of Renewable Energy Technologies</p> <p>Salient feature of renewable energy</p> <p>& Motivational Lecture</p>	<ul style="list-style-type: none"> • Course Introduction • Job market • Course Applications • Institute/work ethics • Who uses Energy / How much? • Primarily Energy World Consumption • Sources of energy • Job market for Renewable Energy • Introduction to Renewable Energy • Conventional Energy Resources • Application of Renewables of Energy Resources • Concept of Sustainable Energy • Types of Renewable Energy (Wind, Solar, Biomass, Hydro and Tidal) • Renewable Energy Resources in Pakistan 	<p style="text-align: center;">Home Assignment</p> <ul style="list-style-type: none"> • Task 1 <p><u>Details may be seen at Annexure-I</u></p>
Week 2	<p>Utilize the natural Energy in building</p> <p>Calculate Power tariff and compare power tariff</p> <p>Analyze various parameter of energy efficiency management and energy Conservation</p> <p>& Success stories</p>	<p>Students are introduced to:</p> <ul style="list-style-type: none"> • Power demand in Pakistan • Power Generation in Pakistan • Power Policy • Tariff determination of different energy • Contribution of Renewable energy in Pakistan <p>Utilize the natural Energy in building</p> <ul style="list-style-type: none"> • Preparation a list of load accessories • Understanding of specifications of Accessories/Appliances • Knowledge about Energy efficient devices • Load calculation • Preparation of record flow chart to sum up the total load <p>Calculate Power tariff and compare power tariff</p>	<ul style="list-style-type: none"> • Task 2 • Task 3 <p><u>Details may be seen at Annexure-I</u></p>

		<ul style="list-style-type: none"> • Knowledge of Factors effecting efficiency of PV Cell • Formula for finding per unit cost • Calculation of per unit cost • Calculation of Tariff for Solar Power Plant • Procedure for development of comparative analysis of efficiency of Solar and wind Power Plant • Minimum and maximum generation capacity of Solar and wind Power Plant • Per unit generation cost of solar and wind power plant. 	
Week 3	<p>Demonstrate Power backup systems</p> <p>Demonstrate Solar power system and its characteristics</p> <p>Solar Panel Basics Parameter</p> <p>And Motivational Lecture</p>	<p>Students are introduced to:</p> <p>Demonstrate Power backup systems</p> <ul style="list-style-type: none"> • Implement back up system with main source • Shut down main energy source and verify the operation of backup system. <p>Solar Panel Basics Parameter</p> <ul style="list-style-type: none"> • Voltage • Current -Power • Efficiency • Vmax, Imax • Temperature effect <p>Demonstrate Solar power system and its characteristics</p> <ul style="list-style-type: none"> • Visit the installed solar power system • Change the tilt angle of PV modules and observe its effect on power, voltage and current. • Apply shading on the PV modules and observe its effect on power, voltage and current. • Observe the effect when PV modules are in series and parallel. 	<p>• Task 4</p> <p><i><u>Details may be seen at Annexure-I</u></i></p> <p>• Monthly Test 1</p>
Week 4	Arrangement of PV	<p>Students are introduced to:</p> <p>Students are introduced to:</p>	<p>• Task 5</p> <p>• Task 6</p>

	<p>cell</p> <p>Types of PV technologies</p> <p>Different types of Solar PV system (On-Grid, Off-Grid, Hybrid systems)</p> <p>And Success stories</p>	<p>Students are introduced to:</p> <p>Arrangement of PV cell</p> <ul style="list-style-type: none"> • PV Cell-basic unit • PV Cell to PV module and • PV Module to PV arrays • Arrangement of PV modules in series • Arrangement of PV modules in parallel <p>Types of PV technologies</p> <ul style="list-style-type: none"> • Crystalline Silicon <ul style="list-style-type: none"> ✓ Mono crystalline solar cells ✓ Poly crystalline solar cells • Thin film <ul style="list-style-type: none"> ✓ Why thin film technology? ✓ CdTe ✓ CIGS ✓ Amorphous silicon <p>Solar PV system (On-Grid, Off-Grid, Hybrid systems)</p> <ul style="list-style-type: none"> • Explore different solar PV system (On-Grid, Off-Grid, Hybrid systems) 	<ul style="list-style-type: none"> • Task 7 • Task 8 <p><u>Details may be seen at Annexure-I</u></p>
<p>Week 5</p>	<p>Identify Solar System components (Solar PV Panel, Battery, Charge controller, stand for solar PV panel, wire for solar system, reverse meeting)</p> <p>Identify various type of solar panel and their characteristics</p> <p>Identify various type of charge controller and their characteristics</p>	<p>Students are introduced to:</p> <p>Identify Solar System components</p> <ul style="list-style-type: none"> • Visit an installed solar power system • Identify Solar PV panel • Identify charge controller • Identify battery <p>Identify various type of solar panel and their characteristics</p> <ul style="list-style-type: none"> • Differentiate <ul style="list-style-type: none"> ✓ Monocrystalline Solar Panels (Mono-SI) ✓ Polycrystalline Solar Panels (p-Si) ✓ Thin-Film: Amorphous Silicon Solar Panels (A-SI) ✓ Concentrated PV Cell (CVP) 	<ul style="list-style-type: none"> • Task 9 • Task 10 • Task 11 <p><u>Details may be seen at Annexure-I</u></p>

	& Motivational Lecture		
Week 6	<p>Identify type of wire for solar system and their characteristics</p> <p>Simulation Tools for PV System Designing (PVSYST)</p> <p>Simulation Tools for PV System Designing (HELIOSCOPE)</p> <p>& Success stories</p>	<p>Students are introduced to:</p> <p>Wiring Standards and layout for both AC and DC systems</p> <ul style="list-style-type: none"> • Types and sizes of wires available in market • Selection of wire according to the calculated load • Chose the wire for the AC Load system • Wiring of the AC load according to the layout diagram • Precautionary measurement while wiring • Choose the wire for the DC Load system • Wiring of the DC load according to the layout diagram • Precautionary measurement while wiring <p>Simulation Tools</p> <ul style="list-style-type: none"> • Download simulation tools for PV System design like (PVSYST, HELIOSCOPE) • Creating a new Project 	<ul style="list-style-type: none"> • Task 12 <p><i><u>Details may be seen at Annexure-I</u></i></p>
Week 7	<p>Calculate load for solar system as per demand through software and manual and through instruments</p> <p>Select solar system components for one kill watt system</p> <p>Select components for solar system</p>	<p>Students are introduced to:</p> <p>Designing and simulating PV system in PVSYST</p> <ul style="list-style-type: none"> • Stand Alone system designing • Grid connected System Designing • DC grid System Designing • PV Pumping designing • Understanding the database and adding new components. • Energy Forecasting • Shading calculations • System Loss calculations Albedo Settings <p>Select solar system components for one kill watt system</p>	<ul style="list-style-type: none"> • Task 13 <p><i><u>Details may be seen at Annexure-I</u></i></p>

	And Motivational Lecture	<ul style="list-style-type: none"> • Calculate solar PV module capacity as per requirement. • Calculate battery size as per requirement • Select Inverter as per load. • Select suitable size of wires as per load requirement. 	
Week 8	<p>Select angle /view for solar system</p> <p>Solar PV Quality testing methods</p> <p>Install Solar system</p> <p>And Success stories</p>	<p>Students are introduced to:</p> <ul style="list-style-type: none"> • Download and install software to calculate the optimum angle for solar system • Calculate optimum angle for solar modules using above software. <p>Install Solar system</p> <ul style="list-style-type: none"> • Set Up Scaffolding. • Install Solar Panel Mounts. • Install the Solar Panels. • Wire the Solar Panels. • Install Solar Inverter. • Bond Solar Inverter and Solar Battery. • Connect the Inverter to the Consumer Unit. • Start and Test Solar Panels. 	<ul style="list-style-type: none"> • Task 14 • Task 15 <p><i><u>Details may be seen at Annexure-I</u></i></p>
Week 9	<p>Solar PV Testing and troubleshooting</p> <p>Operate solar system</p> <p>Repair and maintenance of solar system</p> <p>& Motivational Lecture</p>	<p>Students are introduced to:</p> <p>Solar PV Testing and troubleshooting</p> <ul style="list-style-type: none"> • Measure Ground continuity. • Measure PV string open circuit voltage • Measure PV string short circuit current. • Tests individual PV modules or strings. 	<ul style="list-style-type: none"> • Task 16 <p><i><u>Details may be seen at Annexure-I</u></i></p>
Week 10	<p>Install reverse/net metering system</p> <p>Calculate load power through</p>	<p>Students are introduced to:</p> <p>Install reverse/net metering system</p> <ul style="list-style-type: none"> • Select proper Bidirectional energy meter for net metering 	<ul style="list-style-type: none"> • Task 17 • Task 18

	<p>clamp meter/ multimeter</p> <p>Identify various type of battery and their characteristics</p> <p>And Success stories</p>	<ul style="list-style-type: none"> • Make connection of solar system and Grid supply with bidirectional energy meter as per diagram. <p>Calculate load power through clamp meter/ multimeter</p> <ul style="list-style-type: none"> • Measure the voltage of load with the help of voltmeter • Measure load current with the help of clamp meter. • Calculate power of load using formula. <p>Identify various type of battery and their characteristics</p> <ul style="list-style-type: none"> • Differentiate <ul style="list-style-type: none"> ✓ Deep cycle battery ✓ VRLA battery ✓ AGM battery ✓ Gel battery 	<p><u>Details may be seen at Annexure-I</u></p>
<p>Week 11</p>	<p>Select appropriate battery as pe load demand</p> <p>Serries parallel connection of batteries</p> <p>Test specific gravity of batteries with hydrometer</p> <p>& Motivational Lecture</p>	<p>Students are introduced to:</p> <ul style="list-style-type: none"> • As per load requirement select proper type and size of battery • Make Series connection of battery to get required voltage. • Make Parallel connection of batteries to get required value of current. <p>Test specific gravity of batteries with hydrometer</p> <ul style="list-style-type: none"> • Check the battery charging condition using hydrometer by measuring the specific gravity of the lead acid battery 	<ul style="list-style-type: none"> • Task 19 • Task 20 • Task 21 <p><u>Details may be seen at Annexure-I</u></p>
<p>Week 12</p>	<p>Perform Batteries Management</p> <p>Design Solar DC water pumping system as per customer demand</p> <p>Select components for designing</p>	<p>Students are introduced to:</p> <p>Design Solar DC water pumping system as per customer demand</p> <ul style="list-style-type: none"> • Confirm the head and flow of water pump • Select the power of the water pump as per requirement • Select appropriate DC controller as per load. 	<ul style="list-style-type: none"> • Task 22 <p><u>Details may be seen at Annexure-I</u></p>

	& Success stories	<ul style="list-style-type: none"> • Calculate solar panel capacity as per load • Calculate Battery size as per load • Make Selection of the cable according to specification 	
Week 13	Midterm		
Week 14	<p>Install /Operate solar DC water pump</p> <p>Repair and maintain solar DC water pump</p> <p>& Success stories</p>	<p>Students are introduced to:</p> <p>Install/operate solar DC water pump</p> <ul style="list-style-type: none"> • As per above calculation arrange water pump, Dc controller, solar PV modules, cables, and circuit breaker. • Interconnect all components of solar water pump as per diagram. • Start and Test DC water pump. <p>Repair and maintain solar DC water pump</p> <ul style="list-style-type: none"> • Check the physical condition of the system to ensure it is secure and undamaged • Specifically examine the condition of the pump including its impeller, seals, bearings, valves, and volute. • Assess the condition of pipework for wear or damage • Ensure sump and floats are clean • Check electrical components to ensure insulation is intact, fuses are in good condition and that bulbs and heaters are working properly • Finally, check that all safeguards are operating correctly, and that alarm beacons and buzzers are functional. 	<ul style="list-style-type: none"> • Home Assignment • Task 23 <p><i><u>Details may be seen at Annexure-I</u></i></p>
Week 15	<p>Demonstrate Solar water heating system.</p> <p>Select solar water Heating system as per customer demand</p>	<p>Students are introduced to:</p> <p>Demonstrate Solar water heating system.</p> <ul style="list-style-type: none"> • Visit the installed solar water heating system and identify <ul style="list-style-type: none"> ✓ Solar Collectors ✓ Heat exchanger ✓ storage tank ✓ Controller system ✓ Backup heater 	<ul style="list-style-type: none"> • Task 24 • Task 25 <p><i><u>Details may be seen at Annexure-I</u></i></p>

	<p>Install solar water Heating system</p> <p>& Motivational Lecture</p>	<p>Select solar water Heating system as per customer demand</p> <ul style="list-style-type: none"> • Determine if site is suitable. • Decide what type of system meets the customer needs and lifestyle. • Contact a Solar Contractor or Manufacturer <p>Install solar water Heating system</p> <ul style="list-style-type: none"> • Mount solar collectors on your roof. • Install storage tanks & heat exchanger. • Install piping systems for transfer fluid. • Install water transport pipes. • Install control systems. • Insulate the system. 	
Week 16	<p>Repair and maintain solar water heating system</p> <p>Define wind energy and its characteristics</p> <p>& Success stories</p>	<p>Students are introduced to:</p> <p>Repair and maintain solar water heating system</p> <ul style="list-style-type: none"> • Check Collector shading • Check Collector soiling • Check Collector glazing and seals • Check Piping and wiring connections • Check Piping and wiring insulation • Check Support structures • Check Heat transfer fluids • Check Storage systems <p>Define wind energy and its characteristics</p> <ul style="list-style-type: none"> • Explore about wind energy • Differentiate different types of wind energies (Utility-scale wind, Distributed or "small" wind, Offshore wind) • Calculate wind power. 	<ul style="list-style-type: none"> • Task 26 <p><i><u>Details may be seen at Annexure-I</u></i></p>
Week 17	<p>Biomass Energy technology</p> <p>& Motivational Lecture</p>	<p>Students are introduced to:</p> <p>Introduction to biomass system</p> <ul style="list-style-type: none"> • Biomass energy technology resource, and its feasibility • Biomass potential of power generation around the world • Types of technologies: • anaerobic digestion (bio-methane) • gasification 	<ul style="list-style-type: none"> • Task 27 <p><i><u>Details may be seen at Annexure-I</u></i></p>

<p>Week 18</p>	<p>Components of biogas plant</p> <p>Factors that affect the performance of biogas plant)</p> <p>& Success stories</p>	<p>Students are introduced to:</p> <p>Components of biogas plant</p> <ul style="list-style-type: none"> • Components involved in the system • Biogas plant components • Working of individual components • Mechanical Hardware Description <p>Factors that affect the performance of biogas plant</p> <ul style="list-style-type: none"> • Understanding of factors that vary the performance of plant • Temperature • Retention time • Air • Bacteria • PH 	<ul style="list-style-type: none"> • Task 28 <p><i><u>Details may be seen at Annexure-I</u></i></p> <ul style="list-style-type: none"> • Monthly Test 5
<p>Week 19</p>	<p>Employable Project/Assignment (6 weeks i.e. 21-26) in addition of regular classes.</p> <p style="text-align: center;">OR</p> <p>On job training (2 weeks)</p>	<ul style="list-style-type: none"> • Guidelines to the Trainees for selection of students employable project like final year project (FYP) • Assign Independent project to each Trainee • A project based on trainee’s aptitude and acquired skills. • Designed by keeping in view the emerging trends in the local market as well as across the globe. • The project idea may be based on Entrepreneur. • Leading to the successful employment. • The duration of the project will be 6 weeks • Ideas may be generated via different sites such as: <p>https://1000projects.org/</p> <p>https://nevonprojects.com/</p>	

		<p>https://technofizi.net/best-computer-science-and-engineering-cse-project-topics-ideas-for-students/</p> <p>https://engineering.eckovation.com/plc-based-final-year-projects/</p> <ul style="list-style-type: none"> • Final viva/assessment will be conducted on project assignments. • At the end of session the project will be presented in skills competition • The skill competition will be conducted on zonal, regional and National level. • The project will be presented in front of Industrialists for commercialization • The best business idea will be placed in NAVTTC business incubation center for commercialization. <p>-----</p> <p style="text-align: center;">OR</p> <p>On job training for 2 weeks:</p> <ul style="list-style-type: none"> • Aims to provide 2 weeks industrial training to the Trainees as part of overall training program • Ideal for the manufacturing trades • As an alternate to the projects that involve expensive equipment • Focuses on increasing Trainee’s motivation, productivity, efficiency and quick learning approach. 	
Week 20	Biomass Energy technology	Students are introduced to: System design and installation	<ul style="list-style-type: none"> • Task 29 • Task 30

	<p>(System design and installation)</p> <p>& Success stories</p>	<ul style="list-style-type: none"> • Predesign considerations • Environmental impact and analysis • Design guidance (sizing, selecting, autonomy, storage, manufacturers) • Site selection • Component Selection • System practical design of components and installation • Case studies, best practice analysis, manufacturers <p>Biodiesel</p> <ul style="list-style-type: none"> • What is biodiesel • Production steps of biodiesel • Applications of biodiesel <p>Electricity Production</p> <ul style="list-style-type: none"> • Understanding the conversion of biomass to electricity • How biomass is used to generate electricity? • Use of biogas in electricity production • Raw material for bio digesters 	<p><u>Details may be seen at Annexure-I</u></p>
<p>Week 21</p>	<p>Generate report of site work</p> <p>Analyze job in local market</p> <p>CV building as per job demand</p> <p>& Motivational Lecture</p>	<p>Students are introduced to:</p> <p>Generate report of site work</p> <ul style="list-style-type: none"> • Decide on the 'Terms of reference' • Decide on the procedure • Find the information • Decide on the structure • Draft the first part of your report • Analyse your findings and draw conclusions • Make recommendations • Draft the executive summary and table of contents • Compile a reference list • Revise your draft report <p>Analyze job in local market</p> <ul style="list-style-type: none"> • Review the job requirements. • Research similar job descriptions. 	<ul style="list-style-type: none"> • Task 31 • Task 32 <p><u>Details may be seen at Annexure-I</u></p>

		<ul style="list-style-type: none"> • Identify the outcomes required for the job. • Examine the job efficiencies. • Determine the skills and training required. • Define the salary bands. • Continue to evolve the job. <p>CV building as per job demand</p> <ul style="list-style-type: none"> • Write down your Objective. • Enlist your Key skills and experience. • Write down your Education. • Write down your work experience. • Enlist Additional skills. • Write down your Interests and activities. • Enlist References if any. 	
Week 22	<p>Analyze job demand in any two-international country</p> <p>Jobs Applying procedure in any two-international country</p> <p>Analyze customer demand</p> <p>& Success stories</p>	<p>Students are introduced to:</p> <p>Analyze job demand in any two-international country</p> <ul style="list-style-type: none"> • Be clear about why you want to work overseas. • Keep an open mind about your choice of location. • Start with the constraints. • Consult with your employer. • Do your research. • Think transferable skills. <p>Jobs Applying procedure in any two-international country</p> <ul style="list-style-type: none"> • Determine the type of job you want. • Decide what country you want to work in. • Find a job you're interested in. • Apply for a visa or work permit. • Update and localize your resume. • Apply for the job. <p>Analyze customer demand</p> <ul style="list-style-type: none"> • Collection of information from customer. 	<ul style="list-style-type: none"> • Task 33 • Task 34 • Task 35 <p><i><u>Details may be seen at Annexure-I</u></i></p>

		<ul style="list-style-type: none"> • Situational analysis and specification of objectives • Conduct of market survey. 	
Week 23	<p>Perform cost analysis of customer demand</p> <p>Conduct market survey for project estimation</p> <p>& Motivational Lecture</p>	<p>Students are introduced to:</p> <p>Perform cost analysis as per customer demands.</p> <ul style="list-style-type: none"> • Categorizing Costs • Collect Data for Cost Analysis • Calculate the Costs <p>Conduct market survey for project estimation</p> <ul style="list-style-type: none"> • Set a clear goal. • Know what target market to survey. • Know what you want to investigate. • Get help from the people who know surveys. • Consider the best way to get your answers. • Administer the survey effectively. • Conduct a thorough survey analysis. 	<ul style="list-style-type: none"> • Task 36 • Task 37 <p><i><u>Details may be seen at Annexure-I</u></i></p>
Week 24	<p>Prepare quotation for customer</p> <p>Negotiate /Deal with customer and signed MOU</p> <p>& Success stories</p>	<p>Students are introduced to:</p> <p>Prepare quotation for customer</p> <ul style="list-style-type: none"> • Construct your quote clearly and logically • Include all necessary information • Try to send your quotes quickly • Include your contact information like company name and phone number and try to follow up quotes with another message after a couple of days. • If you miss out on a big deal, try to get feedback about why you were not chosen. Was it that your price was too high, or was your quote lacking in some way? 	<ul style="list-style-type: none"> • Task 38 • Task 39 <p><i><u>Details may be seen at Annexure-I</u></i></p>

		<ul style="list-style-type: none"> • If your business can support it, try setting generous payment terms as an incentive. <p>Negotiate / Deal with customer and signed MOU</p> <ul style="list-style-type: none"> • Term/duration of the MOU. • Cancellation provisions. • MOU review process • Dispute resolution, including (or excluding) legal actions, negotiations, consultations, or executive actions. • Waivers and rights involved in the MOU to make compensation claims related to the execution of the MOU against one another. • Intellectual Property provisions. • Privacy provisions • Methods for transferring funds (if applicable). 	
Week 25	<p>Complete the Work done on site</p> <p>Develop professionalism</p> <p>& Motivational Lecture</p>	<p>Students are introduced to:</p> <p>Complete the Work done on site</p> <ul style="list-style-type: none"> • Collect all related work items • Develop a process • Get organized. • Set a time to review • Just do it! <p>Develop professionalism</p> <ul style="list-style-type: none"> • Be productive • Develop a professional image • Take the initiative • Maintain effective work habits • Manage your time efficiently • Demonstrate integrity • Provide excellence. • Be a problem-solver • Be resilient • Communicate effectively • Develop self-awareness • Build relationships 	<ul style="list-style-type: none"> • Task 40 <p><i><u>Details may be seen at Annexure-I</u></i></p>

<p>Week 26</p>	<p>Develop work ethics</p> <p>Follow teamwork environments principles</p> <p>& Success stories</p>	<p>Students are introduced to:</p> <p>Develop work ethics</p> <ul style="list-style-type: none"> ● Practice punctuality. Develop the habit of being on time or early for all appointments. ● Develop professionalism. Professionalism goes beyond a crisp white shirt and tie. ● Cultivate self-discipline. ● Use time wisely. ● Stay balanced. <p>Follow teamwork environments principles</p> <ul style="list-style-type: none"> ● Effective Communication amongst team members. ● Reliable team members. ● Good approach to conflict management. ● Strong and effective leadership. ● Effective allocation of resources. ● Mutual respect amongst team members. ● Constructive working relationship. ● Positive approach to diversity and equality. 	<p>● Task 41</p> <p><u>Details may be seen at Annexure-I</u></p>
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Week	Task No.	Description
Week-1	Task-1	Explore renewable energy sources and make comparison of them with respect to (cost, advantages, disadvantages, emissions)
Week-2	Task-2	Calculate Power tariff of solar power, thermal power and WAPDA power for one Kilowatt system for one month and compare power tariff, also calculate payback period of solar
	Task-3	Measure power of Solar PV module by measuring short circuit voltage and current
Week-3	Task-4	Explore the effect of tilt angle, shading and light intensity on the output power of solar PV module
Week-4	Task-5	Explore different types of Solar PV Technologies and make comparison of them with respect to (Advantages, disadvantages, and cost)
	Task-6	Explore the difference between On-grid, Off-Grid and Hybrid Solar PV system
	Task-7	Connect Solar PV module in series to get desire level of voltage
	Task-8	Connect Solar PV module in parallel to get desire level of current
Week-5	Task-9	Identify different parts of Solar power system
	Task-10	Compare efficiency, cost, advantages, and disadvantages of Monocrystalline, Polycrystalline, Amorphous Silicon and Concentrated PV cell.
	Task-11	Explore different types of charge controller and compare their characteristics.
Week-6	Task-12	Explore the wire used for solar PV system installation according to their size and current ratings.
Week-7	Task-13	Using software, design Grid connected System and calculate Shading and system loss.
Week-8	Task-14	Calculate Number of solar PV modules and size of battery for 1 KW Solar PV system.
	Task-15	install 1 KW Solar PV system for Home.
Week-9	Task-16	Check individual Solar PV module among the installed string and verify their output power with their rated power. Identify faulty module if any.
Week-10	Task-17	Install bidirectional energy meter for net metering.
	Task-18	Explore Deep cycle, VRLA, AGM and Gel Batteries and make comparison of them with respect to (Advantages, disadvantages, and cost)
Week-11	Task-19	Connect batteries in series to get desire level of voltage
	Task-20	Connect batteries in parallel to get desire level of current
	Task-21	Use hydrometer to check the specific gravity of lead acid battery.

Week-12	Task-22	Design Solar DC water pumping system as per customer demand
Week-13		Midterm
Week-14	Task-23	Install Solar DC water pumping system.
Week-15	Task-24	Identify parts of solar water heating system.
	Task-25	Install solar water heating system.
Week-16	Task-26	Repair and maintain solar water heating system
Week-17	Task-27	Explore biomass energy resources
Week-18	Task-28	Identify the parts of biomass power plant.
Week-19		Project week
Week-20	Task-29	Design biomass power plant
	Task-30	Install biomass power plant
Week-21	Task-31	Analyze job in local market
	Task-32	Build your CV as per job demand
Week-22	Task-33	Analyze job demand in international country.
	Task-34	Apply for job in abroad.
	Task-35	Analyze customer demand
Week-23	Task-36	Perform cost analysis as per customer demand.
	Task-37	Conduct market survey for project estimation
Week-24	Task-38	Prepare quotation for customer
	Task-39	Negotiate / Deal with customer and signed MOU
Week-25	Task-40	Complete the Work done on site
Week-26	Task-41	Develop work ethics

Renewable Energy System Design (Solar & Wind)

What is freelancing and how you can make money online - BBCURDU

<https://www.youtube.com/watch?v=9jCJN3Ff0kA>

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

21 Yr Old Pakistani Fiverr Millionaire | 25-35 Lakhs a Month Income | Interview

<https://www.youtube.com/watch?v=9WrmYYhr7S0>

Success Story of a 23 Year - Old SEO Expert | How This Business Works | Urdu Hindi Punjabi

<https://www.youtube.com/watch?v=tIQ0CWgszI0>

Failure to Millionaire - How to Make Money Online | Fiverr Superhero Aaliyaan Success Story

<https://www.youtube.com/watch?v=d1hocXWSpus>

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:	

<ul style="list-style-type: none"> • Understand the communication skills and how it works. • Understand what communication skills mean • Understand what skills are important for communication skills 	<ul style="list-style-type: none"> • Podium • Projector • Computer • Flip Chart • Marker 	<ul style="list-style-type: none"> • Communication • 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

	<p>challenge). Allow young people to ask any questions about the session topic.</p>
<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 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.</p> <p>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 and Success Stories (Course Outlines)

Sr #	Topic title	Contents	Theme
1	Success stories	<ol style="list-style-type: none"> 1. Story of Skill worker who get good job. 2. Entrepreneur /self-business 3. Freelancer 	<ol style="list-style-type: none"> 1. Family Background 2. How to get Training 3. How to get job 4. Success trait 5. Few word of advice for youth
2	Motivational Lectures	<ol style="list-style-type: none"> 1. Soft skills 2. work Ethics 3. Personality Grooming 	<p>Good Habits</p> <ul style="list-style-type: none"> • Punctuality • Honesty • Positive attitude <p>Interpersonal skills</p> <ul style="list-style-type: none"> • Determinant • Consistent • Welling worker • Team work • Initiative • Hardworking • Creative • Enthusiastic • Goal oriented • Self-motivated • Communication • Loyalty

MOTIVATIONAL LECTURES LINKS.

<u>TOPIC</u>	<u>SPEAKER</u>	<u>LINK</u>
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	https://www.youtube.com/watch?v=5fS3rj6eIFg

	Wayne Dyer Eckart Tolle	
Control Your EMOTIONS	Jim Rohn Les Brown TD Jakes Tony Robbins	https://www.youtube.com/watch?v=chn86sH0O5U
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

Annexure-IV

SUCCESS STORY

S. No	Key Information	Detail/Description
1.	Self & Family background	<p>Danyal Saleem, who lives in Mirpur (AJK), is an example of how hard work and perseverance can reap rich rewards when bidding for projects online. The graphic designer works exclusively on an online freelancing platform and has earned, on average, US\$20,000 per month for the past several months. But this isn't a story of overnight success – Danyal has had to work hard to differentiate himself and stay true to his goal.</p> <p>It was a full year later, in May 2017, when Danyal finally decided to jump in. He signed up for one of the numerous sites that connect designers or coders with people or companies that have small projects, like</p>

		<p>designing a logo or building a website. He had already started a small business to help pay for his college education, so he was nervous and apprehensive about the decision. “I gave myself two or three months at most. If I didn’t succeed, then I would go back to running the business as it was showing potential,” he says.</p> <p>If at first, you don’t succeed, try try again</p>
2.	<p>How he came on board NAVTTC Training / or got trained through any other source</p>	<p>Certification in graphic designing from STEPS (NAVTTC partner institute)</p>
3.	<p>Post-training activities</p>	<p>Danyal’s area of expertise is in graphic design. In his first month using Fiverr, he pitched mostly for projects centered around logo designing. But it wasn’t so simple. In the first few weeks, he didn’t hear back from even a single client, despite pitching for dozens of projects.</p> <p>“I needed to understand what worked, so I read blogs, participated in forums, and analyzed profiles of successful freelancers. It was an uphill struggle, but I didn’t want to give up,” he explains.</p> <p>Danyal says he understands why clients would be apprehensive giving projects to untested freelancers. They have hundreds of options to choose from, he explains, and to give a project to someone with no experience requires a strong leap of faith.</p> <p>A slow stream of projects started to come Danyal’s way. Within a few months, he was landing an average of a hundred projects every month, with a large number of repeat clients. He also expanded the range of his professional services, branching out from logo design to business cards, banners, Facebook cover pages, letterheads, and stationery.</p> <p>But he’s had to face his fair share of challenges too. The shoddy state of internet infrastructure in his city, Mirpur, threatened to derail his freelancing career. “Sometimes I haven’t had connectivity for two days straight,” he explains. “That’s unthinkable for someone who makes his livelihood on the internet.”</p>

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.
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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.