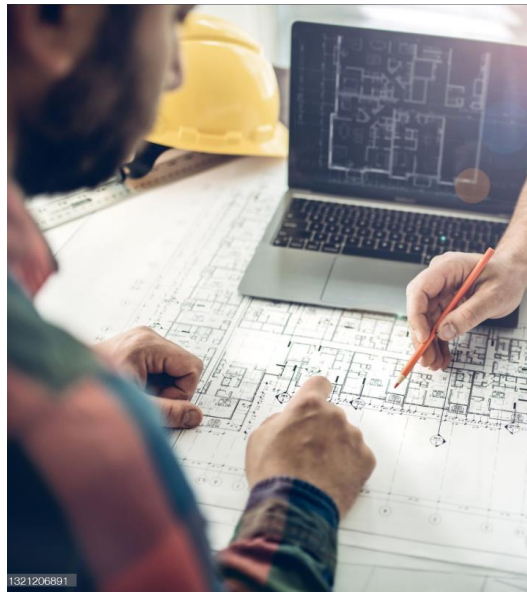




***National Vocational Diploma Level 4 in Computer Aided Design & Manufacturing
(CAD/CAM Technician)***



**National Vocational Diploma Level 5 in Computer Aided Design & Manufacturing
(CAD/CAM Technician)**



(Curriculum)

National Vocational and Technical Training Commission (NAVTTTC)

Government of Pakistan



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Introduction

Definition/Description of training program (CAD/CAM Technician)

Construction sector is one of the booming industries of Pakistan. There is an increasing demand of the CAD/CAM Technician in CAD/CAM. Therefore, the skills are required to be inducted in the future generation. If an individual is planning to pursue a career in construction, this program will be helpful in targeting various commercial and non-commercial projects etc. If an individual is planning to take up CAD Technician in CAD/CAM course, this course will help him weigh their choices better.

Keeping in view of the above the competency based national vocational qualifications have been developed by GIZ & NAVTTTC to train the unskilled human resource on the technical and entrepreneurial skills to be employed / self-employed and inevitably set sustainable impact on their lives by increasing their livelihood income.

Training Course is based on competency standards which are defined by the industry and the traditional role of a trainer changes and shifts towards the facilitation of training. A trainer encourages and assists trainees to learn for themselves. Trainees are likely to work in groups (pairs) and all doing something different. Some are doing practical tasks in the computer Lab, some writing, some not even in the classroom or computer lab but in another part of the building doing safety exercise. As trainees learn at different pace they might be at different stages in their learning, thus learning must be tailored to suit individual needs. The following facilitation methods (teaching strategies) are generally employed.

Purpose of the training program:

The purpose of the training is to provide skilled manpower to improve the existing construction industry. More than 96 % of the Pakistani manpower is working in GCC countries where Saudi Arabia (50.90%) and UAE (33.10%) are the largest destination countries followed



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by Oman (7.26%), Kuwait (1.90%), Bahrain (1.58%), and Qatar (1.41%). The overseas Pakistanis are playing a pivotal role to support the economy in the form of remittances. For this purpose, new qualifications have been developed by GIZ & NAVTTC on CBT&A mode in order to train the unskilled human resource with employable skills.

Overall objectives of training program:

The main objectives of the National Vocational Diploma Level 5 in Computer Aided Design & Manufacturing (CAD/CAM Technician) are as follows:

- Improve the professional competence of software skills
- Capacitate the local community and trainers in modern CBT training, methodologies and processes as envisaged under NVQF
- Provide flexible pathways and progressions in the designing
- Enable the trainees to perform their duties in efficient manner
- Establish a standardized and sustainable system of training for CAD/CAM technology across globe

Competencies to be gained after completion of course:

At the end of the course, the trainee has attained the following core competencies
Develop basic 2D Modeling using Creo Parametric/Solid works

- ✓ Develop basic 3D Modeling using Creo Parametric/Solid works
- ✓ Develop Basic CNC code for Lathe Machine
- ✓ Render 3D Model using Plugins in Sketch Up
- ✓ Develop 3D Model in Autodesk REVIT



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- ✓ Conduct quantity estimation
- ✓ Develop Preliminary Project Plan
- ✓ Develop Project Plan
- ✓ Develop CPM for a project plan

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

- CAD/CAM Technician
- Assistant Manager



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Trainee entry level:

The entry level for National Vocational Diploma Level 5 in CAD/CAM (**CAD/CAM Technician**) is given below:

Title	Entry requirements
National Vocational Certificate Level 4 in Computer Aided Design & Manufacturing (CAD/CAM Technician)	The entry requirement for this qualification would be level 3 Computer Aided Design & Manufacturing (CAD /CAM)

Minimum qualification of trainer:

A. Must be a holder of DAE/Level 5 Diploma in CAD/CAM with at least 2 years relevant experience

OR

B. B.Sc. Technology (Civil) / B.E Civil /BSc Civil Engineering

Recommended trainer: trainee ratio

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

Medium of instruction i.e., language of instruction:

Instructions will be in Urdu/ English/ Local language.



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

The distribution of contact hours is given below:

Total	-	1200 hours
Theory	-	480 hours (40%)
Practical	-	720 hours (60%)
Proposed Course Duration-12 Months		



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Summary template-overview of the curriculum:

Following is the structure of the course:

Sr No	Code	Competency Standards	Occupation	NVQF Level	Category	Estimated Contact Hours			Cr Hr
						Th	Pr	Total	
Level 5									
1	0720 C/C & M3-1	Develop basic 2D Modeling using Creo Parametric/Solid works	CAD/CAM Technician	4	Technical	24	96	120	12
2	0720 C/C & M 3-2	Develop basic 3D Modeling using Creo Parametric/Solid works		4	Technical	24	96	120	12
3	0720 C/C & M 3-3	Develop Basic CNC code for Lathe Machine		4	Technical	42	168	210	12
4	0720 C/C & M 3-4	Render 3D Model using Plugins in Sketch Up		4	Technical	24	96	120	12
5	0720 C/C & M 3-5	Develop 3D Model in Autodesk REVIT		4	Technical	24	96	120	12



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6	0720 C/C & M 3-6	Conduct quantity estimation		4	Technical	24	96	120	12
7	0720 C/C & M 3-7	Develop Preliminary Project Plan		4	Technical	24	96	120	12
8	0720 C/C & M 3-8	Develop Project Plan		4	Technical	24	96	120	12
9	0720 C/C & M3-9	Develop CPM for a project plan		4	Technical	30	120	150	15
		Total				240	960	1200	120
		Percentage				40%	60%	100	



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Module:1 Develop Basic 2D Modelling using CREO parametric/solid work

Objective: This module covers the knowledge and skills required to provide knowledge and skill of basic 2D modeling. It emphasizes on creating 2D sketch, modifying sketch.

Duration:120 Hours
Credit Hours: 12

Theory: 24Hour

Practice: 96Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learn Place
LU:1 Explore Software interface	Trainee will be able to: <ul style="list-style-type: none"> Setup Interface as per requirement Select menu as per requirements. Select working directory for given job. Select appropriate module for the given task. Configure the software for part modeling Select datum plans/point/datum axes accordingly. Create and save template as per job requirement 	<ul style="list-style-type: none"> Software interface Template management Practical Activity Open, edit and save template	Theory-06 Hrs Practice-12 Hrs Total- 18Hrs	PCs/Laptop Solid works/ Cero Parametric	Class & Lab



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LU:2 Create Sketch 2D	Trainee will be able to: <ul style="list-style-type: none"> Select working plan for the given job Create sketch using lines Create sketch using circles and arcs Create sketch using rectangle Create the sketch as per requirement 	<ul style="list-style-type: none"> Knowledge of sketch layout Sketch entities Editing entities Practical Activity Sketch object using basic CREO tools like line, circles, arcs, rectangle	Theory-06 Hrs Practice-24Hrs Total- 30 Hrs	PCs/Laptop Solid works/ Cero Parametric	Class & Lab
LU:3 Apply modify commands	Trainee will be able to: <ul style="list-style-type: none"> Apply offset feature to the given sketch Apply project feature to the given sketch Apply trim to the given sketch Apply chamfer to the given sketch Apply fillet to the given sketch Apply dimension to the given sketch 	<ul style="list-style-type: none"> Knowledge of sketch layout Sketch entities Editing entities Practical Activity Sketch object using different CREO tools like offset, trim, chamfer, and fillet	Theory-06 Hrs Practice-36Hrs Total- 42 Hrs	PCs/Laptop Solid works/ Cero Parametric	Class & Lab



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LU:4 Apply Geometric Constraints	Trainee will be able to: <ul style="list-style-type: none"> • Apply parallel constraint to the given sketch entity • Apply perpendicular constraint to the given sketch entity • Apply equal constraint to the given sketch entity • Apply tangent constraint to the given sketch entity • Apply collinear constraint to the given sketch entity • Apply horizontal constraint to the given sketch entity • Apply vertical constraint to the given sketch entity. • Apply concentric constraint to the given sketch entity 	<ul style="list-style-type: none"> • Parallel constraint to the given sketch entity • Horizontal and vertical constraint to the given sketch entity • Geometric constraints <p>Practical Activity</p> <p>Draw 2D sketch as per given requirements</p>	Theory-06 Hrs Practice-48 Hrs Total- 54 Hrs	PCs/Laptop Solid works/ Cero Parametric	Class & Lab
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Module:2 Develop Basic 3D Modelling using CREO parametric/solid work

Objective: This module covers the knowledge and skills required to to provide knowledge and skill of basic 2D modeling. It emphasizes on creating 2D sketch, modifying sketch.

Duration:120 Hours
Credit Hours: 12

Theory: 24Hour

Practice: 96Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU:1 Create Simple 3D part using Extrude	Trainee will be able to: <ul style="list-style-type: none"> Create sketch as per requirements Extrude sketch as per given specification Apply extrude cut to remove material from given sketch Apply flip extrude direction as specified Apply material to object as per specification. 	<ul style="list-style-type: none"> Software interface Extrude Extrude cut Flip Extrude Practical Activity <ul style="list-style-type: none"> Create 2D sketch and Extrude the sketch as per given specification 	Theory-06 Hrs Practice-18Hrs Total- 24 Hrs	PCs/Laptop Solid works/ Cero Parametric	Class & Lab



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LU:2 Create 3D part using revolve feature	Trainee will be able to: <ul style="list-style-type: none"> • Create sketch as per given requirements • Create axis of rotation • Apply revolve feature • Manage the angle of rotation • Create revolve cut using revolve feature • Edit the parameter of revolve feature • Apply material to object as per specification. 	<ul style="list-style-type: none"> • Knowledge of following commands • Revolve • Revolve cut • Angle of rotation • Edit parameter of the revolve tool <p>Practical Activity</p> <p>Create 3D sketch and revolve the sketch</p>	Theory-06 Hrs Practice-33Hrs Total- 39 Hrs	PCs/Laptop Solid works/ Cero Parametric	Class & Lab
LU:3 Apply features to 3d model	Trainee will be able to: <ul style="list-style-type: none"> • Apply thicken to the 3d model • Apply round feature to the 3d model • Apply shell feature to the 3d model • Apply hole feature to the 3d model • Apply draft feature to the 3d model • Apply rib feature to the 3d model • Apply slice feature to the 3d model 	<ul style="list-style-type: none"> • Round feature to the 3d model • Shell feature to the 3d model • Hole feature to the 3d model • Draft feature to the 3d model • Rib feature to the 3d model <p>Practical Activity</p>	Theory-06Hrs Practice-33Hrs Total- 39 Hrs	PCs/Laptop Solid works/ Cero Parametric	Class & Lab



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		Produce and revolve model as per given specification.			
LU:4 Edit 3D model	Trainee will be able to: <ul style="list-style-type: none"> Edit dimension of the given 3d model Edit features of the given 3D model Reorder feature in the given 3D model Edit references of the 3D model Apply pattern tool as per given specifications. 	<ul style="list-style-type: none"> Dimension editing of the 3d model Feature editing of the 3d model <p>Practical Activity</p> <p>Produce 3D model and use edit features to edit the model</p>	Theory-06Hrs Practice-36Hrs Total- 42Hrs	PCs/Laptop Solid works/ Cero Parametric	Class & Lab



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Module:3 Render 3D Model using Plugins in Sketch Up

Objective: This module covers the skills and knowledge required to provide Render Model using V-Ray and Render Model using Key shot for solid works.

Duration: 210 Hours
Hours: 21

Theory: 42 Hours

Practice:168Hours

Credit

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU:1 Render Model using V-Ray	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Install V-Ray software to meet the specific outcome as per requirement. • Apply textures to the 3D model as specified. • Apply light to illuminate model to get the required scene of image. • Apply shadow of 3D object according to the movement of light. • Apply material to the object as per given requirement. • Apply render to the model as per given requirement. 	<ul style="list-style-type: none"> • V-Ray software • Texture to the 3D model • Shadow of 3D object • 3D Render • 3D solids, surfaces, • Purpose of rendering • 3D Navigate control • Functions of different camera settings. • Importance of scene creation 	<p>Theory-21Hrs</p> <p>Practice-99Hrs</p> <p>Total- 120 Hrs</p>	<p>PCs/Laptops</p> <p>3ds Max</p> <p>AutoCAD</p> <p>Sketch up</p> <p>V-Ray</p> <p>Sketch up</p>	<p>Class & Lab</p>



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	<ul style="list-style-type: none"> Add scene for different camera views to elaborate the model. 	<ul style="list-style-type: none"> Preset views such as isometric, top, bottom, front, left, etc. Perspective projection and parallel projection <p>Practical Activity</p> <p>Apply light to illuminate model to get the required scene of image.</p>			
LU:2 Render Model using Key shot for solid works.	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Install Key shot software to meet the specific outcome as per requirement. Apply textures to the 3D model as specified. Apply light to illuminate model to get the required scene of image. Apply shadow of 3D object according to the movement of light. Apply material to the object as per given requirement. Apply render to the model as per given requirement. Add scene for different camera views to elaborate the model. 	<ul style="list-style-type: none"> Key Shot software Texture to the 3D model Shadow of 3D object 3D Render 3D solids, surfaces, Purpose of rendering 3D Navigate control Functions of different camera settings. Importance of scene creation Preset views such as isometric, top, bottom, front, left, etc. 	Theory-21 Hrs Practice-69Hrs Total- 70 Hrs	PCs/Laptops Solidworks Keyshot	Class & Lab



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		<ul style="list-style-type: none">Perspective projection and parallel projection <p>Practical Activity</p> <p>Perform rendering to given model.</p>			
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Module: 4 Develop Basic CNC code for lathe Machine

Objective: This module covers the skills and knowledge required to Determine job requirements, write basic CNC lathe Machine program, edit basic CNC lathe Machine programs and Perform Basic CNC Lathe Machine Operations

Duration: 120 Hours
Credit Hours: 12

Theory: 24Hour

Practice: 96Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU:1 Specify job requirements	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Interpreted Drawings to produce program according to specifications. • Sequence of operation is determined to produce program according to specification requirements of the process. • Calculate Cutting speed and feed rate based on cutting tool and material. • Process / job / adjustment sheets are filled up with relevant machine, tool and raw material data. 	<p>Drawing interpretation</p> <p>Basic CNC lathe machine program and machining operation</p> <p>Cutting speed and feed rate based on cutting tool and material</p> <p>Practical Activity</p> <p>Calculate Cutting speed and feed rate</p>	<p>Theory-06 Hrs</p> <p>Practice-18Hrs</p> <p>Total- 24 Hrs</p>	<p>Coordinate measuring machine (CMM)</p> <p>Bevel protractor</p> <p>Profile projector</p> <p>Steel rule</p> <p>Paper</p>	Class & Lab



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		based on cutting tool and material			
LU:2 Write basic CNC lathe Machine program.	Trainee will be able to: <ul style="list-style-type: none"> Calculate Coordinates for simple tool path or basic machining functions based on part or product to be produced. Develop standard Program for CNC lathe operations, in accordance with standard operating procedures. 	Program for CNC lathe operation (G-code, M-code) Practical Activity Develop standard Program for drilling in CNC lathe	Theory-06 Hrs Practice-24Hrs Total- 30 Hrs	Dial indicator Dial test indicator Gauges (go-no go, pitch, plug, radius, etc.) Coordinate measuring machine (CMM) (optional) Bevel protractor Profile projector Surface-texture tester Surface-finish comparator Steel rule	Class & Lab
	Trainee will be able to:	<ul style="list-style-type: none"> Basics of CNC lathe machine programs 	Theory-06 Hrs		Class



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LU:3 Edit basic CNC Machine lathe programs.	<ul style="list-style-type: none"> Simulate and edit Program according to standard operating procedures. Save Program according to standard operating procedures. Import Program to the machine according to standard operating procedures. 	<ul style="list-style-type: none"> Simulation of CNC program <p>Practical Activity</p> <p>Edit Program according to standard operating procedures and Import Program to the machine</p>	Practice-27Hrs Total- 33 Hrs	Dial indicator Dial test indicator Gauges (go-no go, pitch, plug, radius, etc.) Coordinate measuring machine (CMM) Bevel protractor Profile projector Surface-texture tester Surface-finish comparator Steel ruler	& Lab
LU:4 Perform Basic CNC Lathe	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Mount Work piece in accordance with standard operating procedures. 	Assembly and detailed drawings CNC Lathe operation	Theory-06 Hrs Practice-27 Hrs	Dial indicator Dial test indicator	Class & Lab



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Machine Operations	<ul style="list-style-type: none"> Perform Basic CNC Lathe operations to produce component as programmed. Perform Corrective measures/adjustments according to the requirement (if necessary). Use Personal protective devices are used in accordance with occupational health and safety (OHS) requirements. Check and measure work pieces according to the Job. Mark, record and report defective work pieces for proper action 	<p>Protective clothing and devices</p> <p>Measuring tool</p> <p>Practical Activity</p> <p>Perform different CNC Lathe operations to produce component</p>	Total- 33Hrs	<p>Gauges (go-no go, pitch, plug, radius, etc.)</p> <p>Coordinate measuring machine (CMM) (optional)</p> <p>Bevel protractor</p> <p>Profile projector</p> <p>Surface-texture tester</p> <p>Surface-finish comparator</p> <p>Steel rule</p>	
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Module:5 Develop 3D Model in REVIT.

Objective: After the completion of this competency standard, the Trainee will be able to develop skill and competence required to use Autodesk Revit for building information modeling which is widely used by architects, structural engineers, MEP engineers, designers and contractors. This software application allows you to design a building, structure and various related components in 3D, annotate the model with drafting elements.

Duration:120 Hours
Credit Hours: 12

Theory: 24Hour

Practice: 96Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Setup Interface	Trainee will be able to: <ul style="list-style-type: none"> • Create custom user interface as per requirement of specific trade. • Create and apply Families as per given specifications and requirements. 	<ul style="list-style-type: none"> • Steps to setup interface. • Define families • Define annotation families. <p>Practical Activity:</p> <p>Setup interface of 3D object using RIVET (provided by instructor)</p>	Theory- 6 Hrs Practical- 18 Hrs Total- 24 Hrs	PCs/Laptops Revit AutoCAD Multimedia Projector	Class Room Lab



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<p>LU2.</p> <p>Create building layout</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Create/import drawings to make layout according to the given requirements. • Modify drawings and objects to meet given criteria • Create 3D prototype model of the drawing according to given measurements. 	<ul style="list-style-type: none"> • Steps to import a drawing on RIVET. • Different layouts of software for specific field. <p>Practical Activity:</p> <p>Prepare a 3D building layout using RIVET (provided by instructor)</p>	<p>Theory- 6Hrs</p> <p>Practical- 24 Hrs</p> <p>Total- 30 Hrs</p>	<p>PCs/Laptops</p> <p>Revit</p> <p>AutoCAD</p> <p>Multimedia Projector</p>	<p>Class Room</p> <p>Lab</p>
<p>LU3.</p> <p>Create construction document</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Create specification/detail for various parts according to given requirements. • Apply specified detail to objects according to given requirements. • Annotate the drawings using set parameters as per given details. 	<ul style="list-style-type: none"> • Define annotation • Steps to prepare a construction document <p>Practical Activity:</p> <p>Prepare a construction document (provided by instructor)</p>	<p>Theory- 6 Hrs</p> <p>Practical- 27 Hrs</p> <p>Total- 33 Hrs</p>	<p>PCs/Laptops</p> <p>Revit</p> <p>AutoCAD</p> <p>Printer</p> <p>Paper</p>	<p>Class Room</p> <p>Lab</p>



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LU4. Render model	Trainee will be able to: <ul style="list-style-type: none"> • Add scene of 3D model according to specification • Add lights for illumination to get the requisite scene of 3D model. • Apply material to the 3D model as per given specification. • Apply texture to 3D model as per given specification. • Assign cameras to execute different views of 3D Model. • Render the 3D model according to required image size or resolution & orientation. 	<ul style="list-style-type: none"> • State principles of lighting and rendering • Steps to apply material, texture and colors to a model. • Define rendering <p>Practical Activity:</p> <p>Render a 3D model using RIVET (provided by instructor)</p>	<div> Theory- 6 Hrs </div> <div> Practical- 27 Hrs </div> <div> Total- 33 Hrs </div>	PCs/Laptops Revit AutoCAD VRay IRender	Class Room Lab
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Module: 6 Conduct Quantity Estimation

Objective: After the completion of this competency standard, the Trainee will be able to quantity estimation. You will be able to demonstrate skills in unit conversion, area, volume calculation and conduct quantity estimation to meet specific target according to the job requirement.

Duration: 120 Hours
Credit Hours: 12

Theory: 24Hour

Practice: 96Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Convert Unit.	Trainee will be able to: <ul style="list-style-type: none"> Convert unit. Make Unit Coherent. 	<ul style="list-style-type: none"> Unit conversion Volume conversion Practical Activity: Convert unit of given drawing	Theory- 6 Hrs Practical- 9 Hrs Total- 15 Hrs	MS office PC Rivet Eagle point	Class Room Lab
LU2. Calculate Area.	Trainee will be able to: <ul style="list-style-type: none"> Calculate surface area of regular shapes. Convert complex surface area into regular areas. 	Define surface area Steps to calculate area of complex surfaces.	Theory- 6Hrs Practical- 30 Hrs	MS office PC Rivet Eagle point	Class Room Lab Visit



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	<ul style="list-style-type: none"> Calculate area of complex surface. 	Practical Activity: Calculate area of given drawing	Total- Hrs 36		
LU3. Calculate Quantities.	Trainee will be able to: <ul style="list-style-type: none"> Calculate volume of given object. Calculate execution. Calculate volume of concrete from given drawings. Calculate B/W (Brick Work) as per given drawing. Calculate Plaster as per the given requirement. Calculate material requirement for different projects. Calculate earth work. (Cut and fill) as per the Job requirement. Calculate Material requirement for Infrastructural Development Project 	<ul style="list-style-type: none"> Type and purpose of quantity. Steps to calculate quantity of earth work, brick work and plastering. Practical Activity: Calculate different quantities of given drawing (provided by instructor)	Theory- Hrs 6 Practical- 30 Hrs Total- Hrs 36	MS office PC Rivet Eagle point	Class Room Lab



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LU4. Prepare Bar bending schedule and BOQ	Trainee will be able to: <ul style="list-style-type: none"> Identify number of steel bars. Calculate length of reinforcement bars Calculate unit weight of reinforcement bar Calculate weight of particular shape of bar Make bar bending schedule from given drawing. Make BOQ (Bill of Quantity) of Project 	<ul style="list-style-type: none"> Define cut length of steel. Steps to prepare bar bending schedule. BOQ State steps to prepare BOQ <p>Practical Activity:</p> <p>Prepare bar bending schedule and BOQ of given drawing (provided by supervisor)</p>	<div> Theory- 6 Hrs </div> <div> Practical- 30 Hrs </div> <div> Total- 36 Hrs </div>	MS office PC Rivet Eagle point	Class Room Lab
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Module: 7 Develop Preliminary Project Plan

Objective: After the completion of this competency standard, the Trainee will be able to develop skill and competence required to prepare flow chart for tendering process, prepare tender documents, tender notice and collect proposals.

Duration: 120 Hours
Credit Hours: 12

Theory: 24Hour

Practice: 96Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Perform Survey of Area	Trainee will be able to: <ul style="list-style-type: none"> Perform reconnaissance survey of area for project. Perform topographic survey of area for project. Prepare map of area for project. 	<ul style="list-style-type: none"> Importance of preliminary planning Define reconnaissance survey. Pre-feasibility study <p>Practical Activity:</p> <p>Perform survey of area</p>	Theory- 05 Hrs Practical- 12 Hrs Total- 17 Hrs	Calculator Ruler Pencil	Class Room Lab



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LU2. Allocate fund & select site of project	Trainee will be able to: <ul style="list-style-type: none"> • Prepare rough cost estimate. • Get Administrative approval of project. • Mark options on the prepared map. • Select most suitable and economic site. 	<ul style="list-style-type: none"> • Rough cost estimate. • Enlist steps to get administrative approval for a project. • Factors considered for selecting economic sites <p>Practical Activity:</p> <p>Review PC1 of the given project</p>	Theory- 05 Hrs Practical- 9 Hrs Total- 14 Hrs	Calculator Ruler Pencil	Class Room Lab
LU3. Design the project features.	Trainee will be able to: <ul style="list-style-type: none"> • Perform Detailed Survey. • Prepare structural design of components of project. • Prepare geometric design / drawings of project. • Prepare working drawings of project. 	<ul style="list-style-type: none"> • Different types of survey. • State steps to prepare geometric design of a project. <p>Practical Activity:</p> <p>Prepare project features of given project.</p>	Theory- 05 Hrs Practical- 21Hrs Total- 12 Hrs	Calculator Ruler Pencil	Class Room Lab
LU4. Prepare detailed estimate of	Trainee will be able to: <ul style="list-style-type: none"> • Work out quantities of items of work. 	<ul style="list-style-type: none"> • Parameters of detailed estimate. 	Theory- 05 Hrs	Calculator Ruler	Class Room Lab



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project- fund allocation.	<ul style="list-style-type: none"> Prepare cost estimate. Get technical sanction from the authority. 	<ul style="list-style-type: none"> Knowledge of units and its conversion. <p>Practical Activity:</p> <p>Prepare detailed estimate of project</p>	<p>Practical- 21 Hrs</p> <p>Total- 26 Hrs</p>	Pencil	
LU5. Conduct feasibility study for execution of project.	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> Draft construction and system feasibility-resources for project. Identify budget allocation and earning from project-economy. Identify social benefits from the project-operational. Estimate quantity of work, time, and available resources for project. Decide the feasibility and prepare feasibility report of project. 	<ul style="list-style-type: none"> Types of feasibility study. Steps involved in feasibility study. Difference between feasibility report and project report Data to be collected and aspects to be considered in feasibility report Aspects to be considered during preparation of project report <p>Practical Activity:</p> <p>Conduct feasibility study for execution of project. (Provided by the instructor)</p>	<p>Theory- 05 Hrs</p> <p>Practical- 33 Hrs</p> <p>Total- 38 Hrs</p>	<p>Calculator</p> <p>Ruler</p> <p>Pencil</p>	<p>Class Room</p> <p>Lab</p>



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Module:8 Develop Project Plan

Objective: After the completion of this competency standard, the Trainee will be able to develop skill and competence required to specify the individual activities, determine the sequence of those activities, draw a network diagram, estimate the completion time for each activity, level the resources, apply constraints, identify the critical path (longest path through the network), update the CPM diagram as the project progresses.

Duration: 120 Hours

Theory: 24 Hours

Practice: 96 Hours

Credit Hours: 12

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place						
LU1. Specify the individual activities	Trainee will be able to: <ul style="list-style-type: none">Collect data from estimate of project.Identify time dependency of activities- Dummy activities.Divide the work into smaller parts.Define the activities depending on resources.Prepare the list of activities along with normal duration	<ul style="list-style-type: none">Define time dependent activity.Define dummy activity.Activities dependent on resources. <p>Practical Activity:</p> <p>Specify the individual activities (depending upon resources, dummy activities and time dependent</p>	<table><tr><td>Theory- Hrs</td><td>6</td></tr><tr><td>Practical- Hrs</td><td>9</td></tr><tr><td>Total- Hrs</td><td>15</td></tr></table>	Theory- Hrs	6	Practical- Hrs	9	Total- Hrs	15	Calculator Ruler Pencil Drawing lab equipment's	Class Room Lab
Theory- Hrs	6										
Practical- Hrs	9										
Total- Hrs	15										



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		activities) of given project.			
LU2. Determine the sequence of activities.	Trainee will be able to: <ul style="list-style-type: none"> Identify the activities of project. Find out predecessor and successor of each activity Arrange them in sequence. 	<ul style="list-style-type: none"> Knowledge on project activities Differentiate between predecessor and successor. <p>Practical Activity:</p> <p>Determine the sequence of planned activities (previously planned)</p>	Theory- 6 Hrs Practical- 15 Hrs Total- 21 Hrs	Calculator Ruler Pencil Drawing lab equipment's	Class Room Lab
LU3. Draw a network diagram.	Trainee will be able to: <ul style="list-style-type: none"> Represent each activity with arc/ line with an arrow. Draw ellipse/ circles at start and end of activities. Observe the direction of arrows. 	<ul style="list-style-type: none"> Progress network/ charts for a project Network and crash programming <p>Practical Activity:</p> <p>Draw a network diagram of given project activities.</p>	Theory- 6 Hrs Practical- 36 Hrs Total- 42 Hrs	Calculator Ruler Pencil Drawing lab equipment's	Class Room Lab



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<p>LU4. Estimate the completion time for each activity.</p>	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Examine the resources for each activity. • Estimate the workability of workforce • Examine the productivity of machinery. • Determine the activities normal duration. • Write down time required to complete each activity. 	<ul style="list-style-type: none"> • Characteristics, operations and safety of construction machinery • Cost of owning and operating machinery • Main factors in selection of machinery • Productivity of different machinery <p>Practical Activity:</p> <p>Estimate the completion time for each activity of given project.</p>	<p>Theory- 6 Hrs</p> <p>Practical- 36 Hrs</p> <p>Total- 42 Hrs</p>	<p>Calculator</p> <p>Ruler</p> <p>Pencil</p> <p>Drawing lab equipment's</p>	<p>Class Room</p> <p>Lab</p>
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Module:9 Develop CPM for a Project Plan

Objective: After the completion of this competency standard, the Trainee will be able to identify the critical path (longest path through the network), update the CPM diagram as the project progresses.

Duration: 150 Hours

Theory: 30 Hours

Practice: 120 Hours

Credit Hours: 12

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Identify the critical path (longest path through the network)	Trainee will be able to: <ul style="list-style-type: none"> Perform forward pass by formula at each project activities. Write early start time and early finish time for each activity. Perform backward pass by formula at each project activities. Write late finish time and late start time for each activity. Level the resources of project. 	<ul style="list-style-type: none"> CPM for a project. Advantages of project planning by network analysis (only with critical path method) Procedure of making schedule i.e., sequencing and time computation of each activity <p>Practical Activity:</p> <p>Identify CPM for a given project</p>	<p>Theory- 10 Hrs</p> <p>Practical- 39 Hrs</p> <p>Total- 49 Hrs</p>	<p>Calculator</p> <p>Ruler</p> <p>Pencil</p> <p>Drawing lab equipment's</p>	<p>Class Room</p> <p>Lab</p>



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	<ul style="list-style-type: none"> • Apply constraints due to resources, time, environment, and season. • Calculate float/ slack time for each activity. • Decide the critical path of construction project-activities with zero float/ slack time. • Calculate the duration of project for completion. 				
LU2. Expedite/ crash progress of work	<p>Trainee will be able to:</p> <ul style="list-style-type: none"> • Enhance workforce force and machinery for activities. • Enhance daily working hours. • Assess the impact of each on cost. • Calculate critical durations for activities. • Calculate time for completion of crash programming. 	<p>Network time, critical path, free float and total float</p> <p>Define crash programming</p> <p>Practical Activity:</p> <p>Expedite/ crash progress of work for given project.</p>	<p>Theory- 10 Hrs</p> <p>Practical- 42 Hrs</p> <p>Total- 52 Hrs</p>	<p>Calculator</p> <p>Ruler</p> <p>Pencil</p> <p>Drawing lab equipment's</p>	<p>Class Room</p> <p>Lab</p>



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LU3. Update the CPM diagram as the project progresses.	Trainee will be able to: <ul style="list-style-type: none"> Record actual time duration during work. Assess the actual cost. 	<ul style="list-style-type: none"> Preparation of work progress charts. Network and crash programming. <p>Practical Activity:</p> <p>Update the CPM diagram as given project progresses.</p>	<p>Theory- 10 Hrs</p> <p>Practical- 39 Hrs</p> <p>Total- 49 Hrs</p>	<p>Calculator</p> <p>Ruler</p> <p>Pencil</p> <p>Drawing lab equipment's</p>	<p>Class Room</p> <p>Lab</p>
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List of Tool, Machinery and Equipment:

SR#	Items/Tools & Equipment	Quantity
1.	Tool pre - setting device (optional)	
2.	Dial indicator	
3.	Dial test indicator	
4.	Gauges (go-no go, pitch, plug, radius, etc.)	
5.	Coordinate measuring machine (CMM) (optional)	
6.	Bevel protractor	
7.	Profile projector	
8.	Surface-texture tester	
9.	Surface-finish comparator	



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10.	Steel rule	
11.	CNC Milling Machine	
12.	Power Mill	
13.	3ds Max	
14.	AutoCAD	
15.	Sketch up	
16.	Lumion	

List of Consumable Supplies

SR#	Consumable Supplies	Quantity
1.	PCs/Laptop	25



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2.	Solid works/ Cero Parametric	As per requirement
3.	Printer	
4.	Paper	
5.	PCs/Laptops	
6.	Multimedia Projector	



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Members of the Curriculum Development Committee

S#	Name	Designation
1	Sadyia Qureshi	Coordinator
2	Aftab Hussain	DACUM Facilitator
3	Ali Raza	DACUM Facilitator
4	Muhammad Abbas Arshad	Site Engineer
5	Muhammad Faizan	Interior/CAD Designer



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S#	Name	Designation
6	Syed Farhan Hamid Ali	Sr. Instructor Pak Swiss Training Center Karachi
7	Muhammad Hassan Arshad	Architect Bahria Town
8	Malik Abdul Basit	Consultant (IT & Overseas employment)
9	Javeed Hayat	Consultant (Survey and Research)



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Members of the Curriculum Validation Committee

S#	Name	Designation
1	Dr. Muhammad Bakhsh DD IT/CS	Pakistan Academy of rural development, Peshawar
2	Jawaria Qazi Web Admin	PBTE, Lahore
3	Ali Raza	Principal Quaid-e-Azam College of Engineering & Technology Okara
4	Aftab Hussain	DACUM Facilitator
5	Nadeem Zaigham Senior Instructor	P-TEVTA



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S#	Name	Designation
6	Muhammad Abbas Arshad Project Engineer	United Engineering Pvt Ltd Jehlum
7	Muhammad Faizan Architectural Designer	Gleaming Architectural
8	Navid Ali Lecturer	KP-TEVTA
9	Amjad Waheed Khan Lecturer	KP-TEVTA
10	Syed Shadab Ali Shah Assistant Professor	KP-TEVTA



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S#	Name	Designation
11	Sammar Jan Siddiqui	P-TEVTA
12	Dr. Muhammad Bakhsh DD IT/CS	Pakistan Academy of rural development, Peshawar