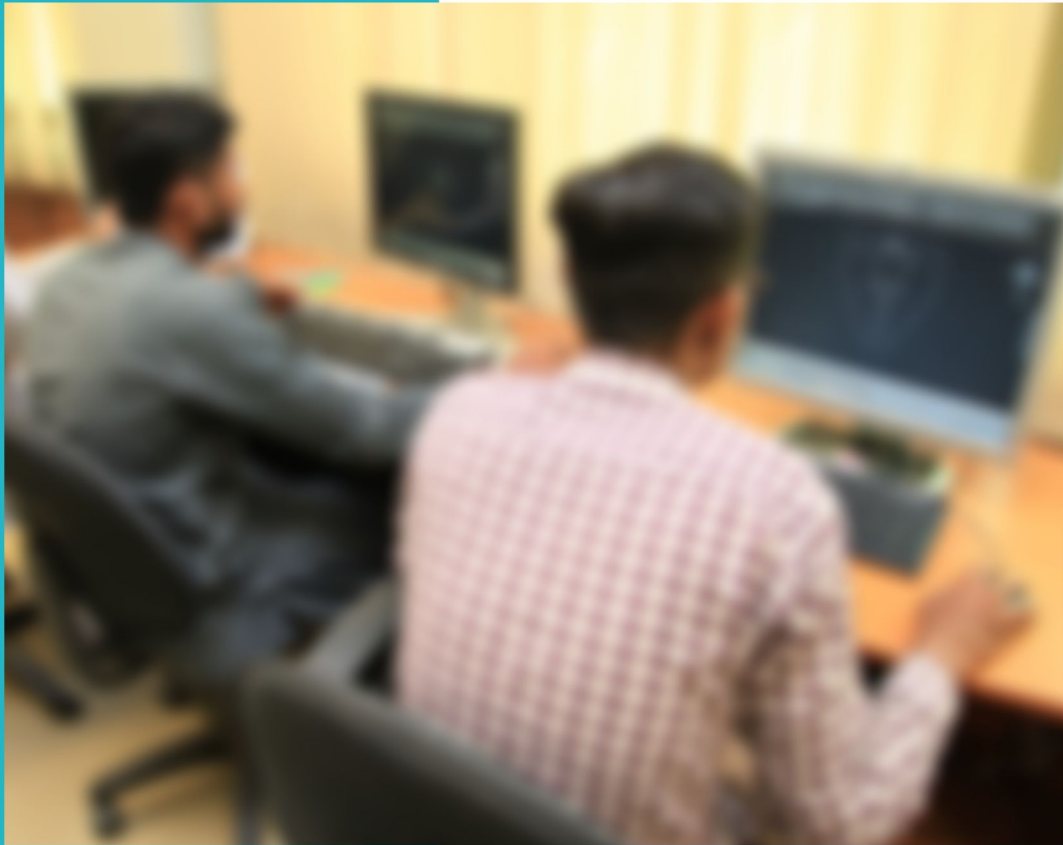


# AUTOCAD



## ASSESSMENT PACKAGES

National Vocational Certificate Level 2

Version 1 - July 2013



EUROPEAN UNION



Kingdom of the Netherlands



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July, 2013

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# AUTOCAD



TRAINER GUIDE

National Vocational Certificate Level 2

Version 1 - July 2013

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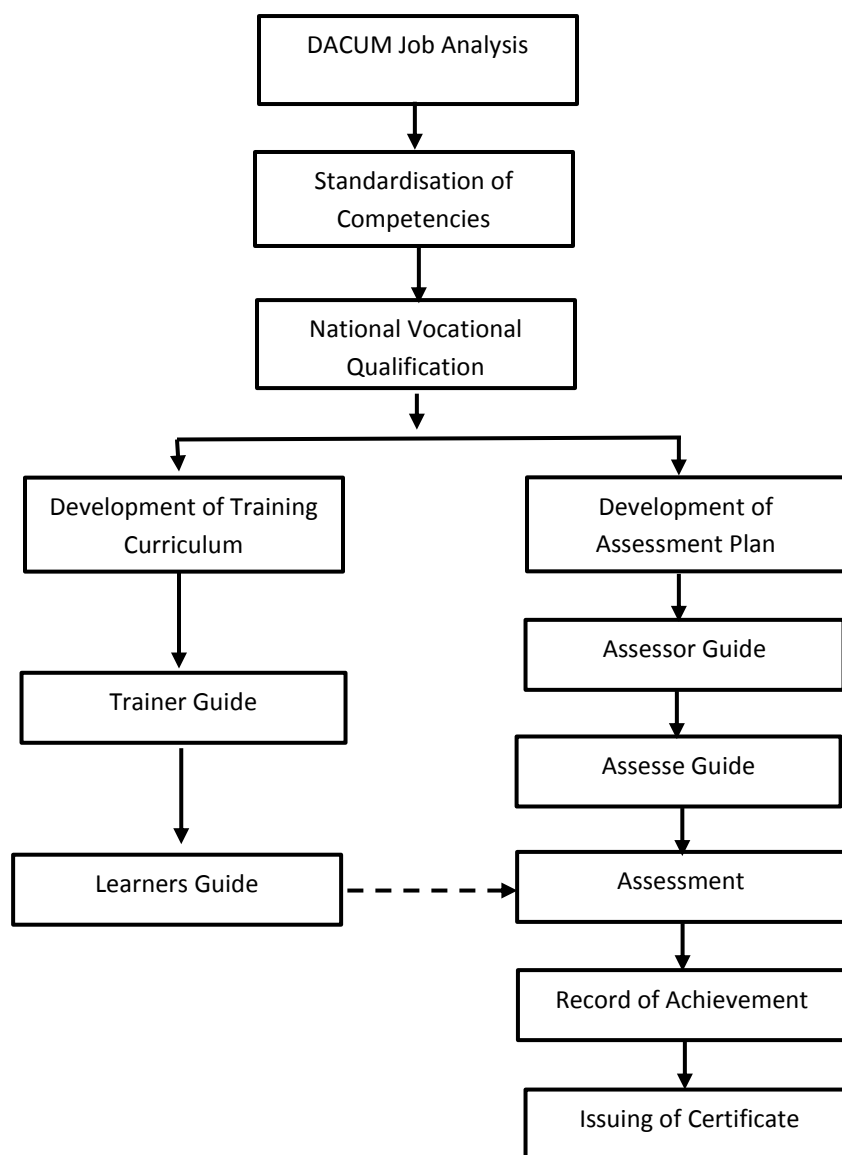
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## INTRODUCTION

This Guide supports the Competency-Based Training Curricula that will enable the trainees to achieve the competency standards that have been set by the relevant industry group.

The NVQF Competency-Based Training Curricula along with the associated Training Guides and the Assessment Guides are all developed from the skill competency standards established by the Industry Advisory Group (IAG).

Figure 1 outlines the process of developing the competencies, developing the curriculum and the assessment requirements, and delivering the training program and the assessments necessary to certify achievement of the competencies.



The Trainer Guide provides guidelines and instructions to Trainers on the approaches that are required and on the organisation and delivery of the curriculum training program.

### *Curriculum*

The Curriculum Manual is included in the Training and Learning Materials Package.

The curriculum is organised as a series of modules. Each module is broken down into a series of Learning Units. Each Learning Unit includes Learning Outcomes, Learning Elements, an estimate of the time needed, a list of materials required and the location for the learning to take place.

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials needed	Location

### *Lesson Plans*

The Trainer will need to develop a coherent set of lesson plans for each module of the curriculum. This Guide includes a Lesson Plan Template. The Lesson Plans must be filed for later review if necessary.

### *Assessment*

It is necessary to assess the knowledge and skills of the trainees at the completion of each module. (See the Assessment Guide for further details)

### *Evaluation of Training Material*

Trainers are invited to evaluate the Training Materials based on their experience of delivering the training. A template is provided to assist.

## EVALUATION OF TRAINING MATERIAL

*The trainers/instructors who implement this training material can inform NAVTTC promptly of any shortcomings in training material on the following format. Please consider it as one of your responsibilities.*

Format

<b>Trade:</b>			
<b>Training Material</b>	<b>Module Title &amp; Module Code</b>	<b>Learning Unit Title &amp; Learning Unit Code</b>	<b>Suggested amendments/ feedback/proposal</b>
Trainer Guide			
Learner Guide			
Trainer Name:		Training Centre:	
Signature of Trainer:		Date:	

## GUIDELINES FOR WRITING LESSON PLAN

The template for lesson plan has been provided at next page. These guidelines are for trainers for writing their own lesson plans which are as follows:

1. Introduce yourself and the Learning Unit, and state the Learning Outcomes of the session clearly to activate attention of learners.
2. In **Introduction** part of lesson plan state the Learning Objectives of the lesson. This allows the learners to organize their thoughts on what they will learn and to perform. Also state some questions to recall prior knowledge of learners to arouse their interest and motivation.
3. In **Body** part of lesson plan present the new information or material that is to be learned. Demonstration of a skill relevant with the Learning Unit is also stated here. Also mention the teaching and learning methods for each learning element from *Trainer Guidelines*, the relevant media including handouts, power-point slides, videos, white board and time duration for each activity in the relevant columns.
4. In **Conclusion** part list the strategies used for summarizing and reviewing the lesson delivered. Also mention the strategies for formative assessment to ensure that the transfer of knowledge and skill has been achieved.



## LESSON PLANS

*Dear Instructors,*

*Model Lesson Plans for one module have been provided in this trainer guide. A format and guidelines for writing Lesson Plans have also been provided in the succeeding pages. You are advised to prepare your own lesson plans for the remaining Learning Units using the suggested format and guidelines.*

## LESSON PLAN -1

<b>Module1</b>	Exhibit Duties and Rights at the Workplace		
<b>Learning Unit 1</b>	Practice Ethics and Professional Conduct		
<b>Learning Outcomes</b>			
<p>The learner will be able to perform the mandatory standard for responsibility, respect, fairness and honesty against the applicable territorial laws.</p>			
Methods	Key Notes	Media	Time
<b>Introduction</b>			
<b>Lecture</b>	<ul style="list-style-type: none"> <li>• Introduce the Learning unit to learners.</li> <li>• Grasp Learner's attention by asking some questions</li> <li>• Create interest among the learners about the topic and its importance</li> </ul>	Learner's guidelines, handbook, Whiteboard & multimedia	15 Min
<b>Main Body</b>			
<i>Lectures</i>	<ul style="list-style-type: none"> <li>• Explain learners about:                             <ul style="list-style-type: none"> <li>○ Decision making and its consequences, concern for resources, subordinates and tangible assets of company.</li> <li>○ Importance and benefits of truthful and fair conduct / communication in the company.</li> </ul> </li> <li>• Discuss truthfulness, honesty and fairness at the workplace with the help of daily attendance register, daily task reports, performance reports etc.</li> <li>• Give different situations to learners for adopting various roles for making certain decisions and performing actions, then consequences of those actions be demonstrated in different ways.</li> <li>• Ask learners to solve case studies regarding decision making in various situations e.g. crisis management, stress management, time management and office management etc.</li> </ul>	Learner's guidelines, handbook, Whiteboard, multimedia, visuals, notebooks, pen/pencils, case studies, activity formats, internet connection	5 Hrs.
<i>Discussion</i>			30 Min
<i>Role Play</i>			
<i>Case Studies</i>			

<b>Conclusion</b>			
<i>Illustrative Talk</i>	Summarize the learning unit by reviewing important aspects, elements, acts and consequences.		15 Min
<i>Question &amp; Answer Session</i>	Conduct Question and answers session to ensure that the learners acquired relevant knowledge of ethics and professional conduct.		
<b>Total time:</b>			06 Hrs.

## LESSON PLAN - 2

<b>Module1</b>	Exhibit Duties and Rights at the Workplace		
<b>Learning Unit 2</b>	Plan Business Process Activities		
<b>Learning Outcomes</b>			
Identify tasks, their scheduling, define milestones and learn optimal utilization of resources.			
Methods	Key Notes	Media	Time
<b>Introduction</b>			
<b>Lecture</b>	<ul style="list-style-type: none"> <li>• Introduce the Learning unit to learners</li> <li>• Grasp Learners' attention by talking about business processes and activities</li> <li>• Create interest among the learners about the topic and its importance</li> </ul>	Learner's guidelines, handbook, Whiteboard & multimedia	30 Min
<b>Main Body</b>			
<p><i>Lectures</i></p> <p><i>Demonstrate</i></p> <p><i>Exercise</i></p>	<ul style="list-style-type: none"> <li>• Explain learners about:                             <ul style="list-style-type: none"> <li>○ Providing due assistance to in-line managers e.g. coordinating recurring meeting, intimating resource availability, creating and keeping documents, validating applicable company defined standards.</li> <li>○ Specific / routine activities that take place in a company.</li> <li>○ Estimation and optimal utilization of time and resources.</li> </ul> </li> <li>• Demonstrate activities like:                             <ul style="list-style-type: none"> <li>○ Requirement gathering</li> <li>○ Designing solution</li> <li>○ Prototype</li> <li>○ Testing</li> <li>○ Documentation</li> </ul> </li> <li>• Give learners an exercise to calculate:                             <ul style="list-style-type: none"> <li>○ Working hours (company / activity)</li> <li>○ Working timings</li> <li>○ Leisure hours</li> <li>○ Official leaves</li> </ul> </li> </ul>	Learner's guidelines, handbook, Whiteboard, multimedia, visuals, notebooks, pen/pencils, case studies, activity formats, measuring tools, internet connection	14 Hrs. 00 Min

<i>Activity</i>	<ul style="list-style-type: none"> <li>• Divide a module into smaller &amp; more manageable components and give learners a smaller activity to perform individually, e.g. testing a drawing may have components like: <ul style="list-style-type: none"> <li>○ Interface</li> <li>○ Coordinates</li> <li>○ Dimensions</li> <li>○ Render cases</li> <li>○ Layout</li> </ul> </li> </ul>		
<b>Conclusion</b>			
<i>Illustrative Talk</i>	Summarize the learning unit by reviewing scheduling of important elements, tasks, achieving milestones, optimizing utilization of resources and other business process activities.		30 Min
<i>Question &amp; Answer Session</i>	Conduct Question and answers session to ensure that the learners acquired relevant knowledge to plan business process activities.		
<b>Total time:</b>			15 Hrs.

## LESSON PLAN - 3

<b>Module1</b>	Exhibit Duties and Rights at the Workplace		
<b>Learning Unit 3</b>	Create Awareness About Rights		
<b>Learning Outcomes</b>			
The learner will be able to recognize the inspirational requirement of human rights in employment context.			
Methods	Key Notes	Media	Time
<b>Introduction</b>			
<b>Lecture</b>	<ul style="list-style-type: none"> <li>• Introduce Learning unit to the learners</li> <li>• Grasp Learners' attention by telling them about rights and their applicability in employment.</li> <li>• Create interest among the learners about the topic and its importance</li> </ul>	Learner's guidelines, handbook, Whiteboard & multimedia	15 Min
<b>Main Body</b>			
<i>Lectures</i>	<ul style="list-style-type: none"> <li>• Explain learners the importance and ways of:                             <ul style="list-style-type: none"> <li>○ Abiding by policies, rules / regulations governing the work and work place.</li> <li>○ Reporting the concerned authority about illegal conduct and / or illegitimate action.</li> <li>○ Protecting propriety and confidential information.</li> </ul> </li> <li>• Give learners an assignment to prepare a complete set of documents required for registration of a particular work-piece under copy rights.</li> <li>• Give different situations to learners like:                             <ul style="list-style-type: none"> <li>○ Abiding by policies, rules / regulations governing the work and work place,</li> <li>○ Reporting the concerned authority about illegal conduct and / or illegitimate action,</li> <li>○ Protecting propriety and confidential information, etc.</li> </ul>                             and ask them to prepare 10-15 minutes video                         </li> </ul>	Learner's guidelines, handbook, Whiteboard, multimedia, visuals, notebooks, pen/pencils, case studies, activity formats, internet connection	5 Hrs. 30 Min
<i>Assignment</i>			
<i>Group Activity</i>			

<i>Case Studies</i>	depicting the scenario and its outcomes at workplace. <ul style="list-style-type: none"> <li>• Ask learners to solve case studies regarding policies, rules &amp; regulation, illegitimate actions / illegal conduct and protecting propriety (Intellectual Property Rights, Copy Rights).</li> </ul>		
<b>Conclusion</b>			
<i>Illustrative Talk</i>	Summarize the learning unit by reviewing important aspects of recognizing the inspirational requirements of human rights, intellectual rights, copy rights etc. in employment context.		15 Min
<i>Question &amp; Answer Session</i>	Conduct Question and answers session to ensure that the learners acquired relevant knowledge and awareness about rights.		
<b>Total time:</b>			06 Hrs.

## DEMONSTRATION OF SKILL

Demonstration or modelling a skill is a powerful tool which is used in vocational training. The instructions for trainers for demonstration are as under:

1. Read the Procedure mentioned in the Learner Guide for the relevant Learning Unit before demonstration.
2. Arrange all tools, equipment and consumable material which are required for demonstration of a skill.
3. Practice the skill before demonstration to learners, if possible.
4. Introduce the skill to learners clearly at the commencement of demonstration.
5. Explain how the skill relates with the skill(s) already acquired and describe the expected results or show the objects to learners.
6. Carry out demonstration in a way that it can be seen by all learners.
7. Perform each step slowly and read out each step of the Performance Guide loudly so that all learners can hear and understand.
8. Identify critical or complex steps, or steps that involve safety precautions to be followed.
9. Explain theoretical knowledge where applicable and ask questions to learners to test their understanding.
10. Repeat critical steps in demonstration, if required.
11. Summarize the demonstration by asking questions to learners.



## OVERVIEW OF PROGRAMME

Course: <Insert Course Name>

Total Course Duration:

### Course Overview:

<Insert Course intent or overview>

Module	Learning Unit	Duration
1: Exhibit Duties and Rights at the workplace	LU1: Practise Ethics and professional conduct LU2: Process business activities LU3: Create awareness of rights	27 hours
2: Perform orientation about AutoCAD 2D Fundamentals	LU1: Control the display in drawings LU2: Create basic drawings LU3: Manipulate objects	70 hours
3: Create 3D Interface drawings	LU1: Develop familiarity with 3D Basics interface LU2: Know about Thickness and Elevation LU3: Visualize the Model	79 hours
4: Draw Coordinates	LU1: Acquire basic terminologies of Z Coordinates LU2: investigate User Coordinates System	64 hours
5: Draw 3D Orbit, Navigations and Model	LU1: Develop familiarity with 3D Orbit LU2: Research Three dimensional navigation LU3: Inspect 3D Object	116 hours
6: Produce 2D Solids and 3D Faces	LU1: Inspect 2D Solids and 3D Faces LU2: Study Edge	48 hours
7: Insert Surfaces	LU1: Know about Basic 3D surfaces LU2: Comprehend Complex surfaces	93 hours

8: Develop Solids	LU1: Create Solids LU2: Edit 3D LU3: Study Solid composites	67 hours
9: Modify Solid Faces	LU1: Modify Solid Faces LU2: Edit Solids	33 hours
10: Navigate Sections and merge Flat Objects from 3D Model	LU1: Handle Section Objects LU2: Handle Flat Objects	40 hours
11: Customize Rendering, Materials and Lights	LU1: Study Rendering LU2: Employ Materials LU3: Employ Lights	163 hours

## TRAINER GUIDELINES

### Module 01: Exhibit Duties and Rights at the workplace

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Practise Ethics and professional conduct	<p>Give illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Responsibility</li> <li>• Respect</li> <li>• Fairness</li> <li>• Honesty</li> </ul> <p>Ask learners to perform a class activity related to responsibility.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Class Room	Learner's Guide
LU2: Process business activities	<p>Give illustrative talk on the following learning elements:</p> <ul style="list-style-type: none"> <li>• Provide due assistance to in-line manager</li> <li>• Define activities</li> <li>• Estimate time,</li> <li>• Achieve work breakdowns</li> <li>• Resource levelling due to work load</li> </ul> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Class Room	Learner's Guide
LU3: Create awareness of rights	<p>Give illustrative talk on the following learning element:</p> <ul style="list-style-type: none"> <li>• Inform ourselves and uphold the workplace policies.</li> <li>• Report Illegal Conduct to Appropriate Management.</li> <li>• Protect proprietary or confidential information.</li> </ul> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Class Room	Learner's Guide

## Module 02: Perform Orientation about AutoCAD 2D Fundamentals

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p>LU1: Control the display in drawings</p>	<p>Demonstrate procedure of creating AutoCAD drawing files.</p> <p>Demonstrate procedure of saving AutoCAD drawing files.</p> <p>Demonstrate use of the AutoCAD visual reference commands including:</p> <ul style="list-style-type: none"> <li>• Precision</li> <li>• Zoom Extent</li> <li>• Drawing LIMITS</li> <li>• Status Bar</li> <li>• GRID Display</li> <li>• PAN Realtime</li> </ul> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	<p>Computer Lab</p>	<p>Learner's Guide, Handouts, Computer, Multimedia.</p>
<p>LU2: Create basic drawings</p>	<p>Demonstrate procedure of drawing using Line commands including:</p> <ul style="list-style-type: none"> <li>• Format</li> <li>• Units Setup</li> <li>• LINE command</li> <li>• Coordinates</li> <li>• Interactive Input method</li> <li>• SNAP Option</li> <li>• World space</li> <li>• User coordinate system</li> <li>• World coordinate system</li> <li>• UCS icon Display</li> </ul> <p>Demonstrate procedure of drawing using Circle commands including:</p> <ul style="list-style-type: none"> <li>• TTR</li> <li>• Relative Coordinate</li> <li>• Coordinate systems</li> <li>• Cartesian coordinate system</li> </ul>	<p>Computer Lab</p>	<p>Learner's Guide, Handouts, Computer, Multimedia.</p>

	<ul style="list-style-type: none"> <li>• Absolute coordinates</li> <li>• Positions</li> <li>• Defining LINE</li> <li>• Close option</li> <li>• CIRCLE command</li> <li>• TTT</li> </ul> <p>Demonstrate procedure of defining positions using the Basic Entry methods</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>		
LU3: Manipulate objects	<p>Demonstrate procedure of using the ERASE command</p> <p>Demonstrate procedure of using the AutoCAD Pan Real-time option</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Computer Lab	Learner's Guide, Handouts, Computer, Multimedia.

## Module 03: Create 3D Interface Drawings

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p>LU1: Develop familiarity with 3D Basics interface</p>	<p>Demonstrate procedure of using different options to draw 3D Basic Ribbons, including:</p> <ul style="list-style-type: none"> <li>• Create</li> <li>• Edit</li> <li>• Draw</li> <li>• Modify</li> <li>• Selection</li> <li>• Coordinates</li> <li>• Layers</li> <li>• Views</li> </ul> <p>Demonstrate procedure of recognizing the steps of executing Pull down menus including:</p> <ul style="list-style-type: none"> <li>• Home</li> <li>• Render</li> <li>• Insert</li> <li>• Manage</li> <li>• Output</li> <li>• Plug-ins</li> <li>• Online</li> <li>• Express Tools</li> </ul> <p>Demonstrate procedure of executing the steps to apply 3D Modelling panels including:</p> <ul style="list-style-type: none"> <li>• Modelling</li> <li>• Mesh</li> <li>• Solid</li> <li>• Editing</li> <li>• Draw</li> <li>• Modify</li> <li>• Section</li> <li>• Coordinates</li> <li>• View</li> <li>• Selection</li> <li>• Layers</li> <li>• Groups</li> </ul> <p>Demonstrate procedure of identifying options 3D Modelling Pull down menus including:</p> <ul style="list-style-type: none"> <li>• Home</li> <li>• Solid</li> </ul>	<p>Computer Lab</p>	<p>Learner's Guide, Handouts, Computer, Multimedia.</p>

	<ul style="list-style-type: none"> <li>• Surfaces</li> <li>• Mesh</li> <li>• Render</li> <li>• Parametric</li> <li>• Insert</li> <li>• Annotate</li> <li>• View</li> <li>• Manage</li> <li>• Output</li> <li>• Plug-ins</li> <li>• Online Express Tools</li> </ul> <p>Demonstrate procedure of identifying Viewports (-VPORTS command) including:</p> <ul style="list-style-type: none"> <li>• Pre-set 3D Viewports</li> <li>• Named Views.</li> </ul> <p>Demonstrate procedure of applying the technique to track the cursor (Steering Wheel) including:</p> <ul style="list-style-type: none"> <li>• Over wedge as full navigation wheel</li> <li>• View object wheel</li> <li>• Orbit, walk up/down</li> <li>• Rewind and its setting</li> </ul> <p>Demonstrate procedure of identifying Viewpoints including:</p> <ul style="list-style-type: none"> <li>• VPOINT command (Rotate switch, DDVPOINT command)</li> <li>• PLAN command</li> </ul> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>		
<p>LU2: Know about Thickness and Elevation</p>	<p>Demonstrate the procedure of applying the Thickness command at command prompt with different values or modify general properties of an object</p> <p>Demonstrate the procedure of executing the “Elev” command at command prompt with different values.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	<p>Computer Lab</p>	<p>Learner’s Guide, Handouts, Computer, Multimedia.</p>

<p>LU3: Visualize the Model</p>	<p>Demonstrate the procedure of controlling the display of edges and shading (Visual Styles) in the viewport that are 2D Wireframe, 3D Wireframe, 3D Hidden, Realistic, Shaded, Shaded with Edges, Shades of Gary, Sketchy and X-Ray.</p> <p>Demonstrate the procedure of regenerating a three-dimensional model with hidden lines using HIDE command.</p> <p>Demonstrate the procedure of setting the grid with DSETTINGS command.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	<p>Computer Lab</p>	<p>Learner's Guide, Handouts, Computer, Multimedia.</p>
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Module 04: Draw Coordinates			
Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Acquire basic terminologies of Z Coordinates	<p>Demonstrate the procedure of creating 3D Cartesian coordinates against 3DPOLY command by specifying start and end points.</p> <p>Demonstrate the procedure to track in Z direction by “O Snap” tracking or F11 key and “Polar” tracking or F10 key.</p> <p>Demonstrate the procedure of running “move” command to move in Z direction by specifying displacement.</p> <p>Demonstrate the procedure of acquiring 3D point filters.</p> <p>Demonstrate the procedure of creating 3D spiral using “helix” command by defining number of turns, diameter and height.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Computer Lab	Learner’s Guide, Handouts, Computer, Multimedia.
LU2: investigate User Coordinates System	<p>Demonstrate the procedure of conducting orientation of the user coordinate system (UCS) axes and the location of the current UCS origin with the execution of command “ucsicon”.</p> <p>Demonstrate the procedure of presenting an overview of “ucs” command with multiple switches including</p> <ul style="list-style-type: none"> <li>• Face</li> <li>• Named</li> <li>• Object</li> <li>• Previous</li> <li>• New</li> <li>• View</li> <li>• World</li> <li>• X/Y/Z.☐</li> </ul> <p>Explain the UCS toolbar.</p> <p>Demonstrate the procedure of the Plan UCS with “PLAN” command.</p> <p>Demonstrate the procedure of incorporating Dynamic UCS with short keys of Ctrl+D.</p>	Class Room/Computer Lab	Learner’s Guide, Handouts, Computer, Multimedia.

	<p>Demonstrate the procedure of restoring a saved and named UCS with “R” key.</p> <p>Demonstrate the procedure of exploring UCS dialog box using “UCSMAN”</p> <p>Demonstrate the procedure of getting the visual feedback of the model by Viewcube.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>		
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## Module 05: Draw 3D Orbit, Navigations and Model

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p>LU1: Develop familiarity with 3D Orbit</p>	<p>Demonstrate the procedure of defining 3D orbit with the command of “3DOrbit” for constrained orbit on selected object.</p> <p>Demonstrate the procedure of providing due assistance in developing zoom and pan facility in 3D orbit.</p> <p>Demonstrate the procedure of applying projection mode by selecting “Perspective” option in 3D orbit.</p> <p>Demonstrate the procedure of selecting different visual styles e.g. 3D Hidden, 3D Wireframe, Conceptual, and Realistic.</p> <p>Demonstrate the procedure of selecting different visual aids e.g. Compass, Grid and UCS Icon.</p> <p>Demonstrate the procedure of setting the 3D view while in the orbit command using preset views.</p> <p>Explain the difference between Free and Continuous orbit. Highlight the use of “Esc” key.</p> <p>Explain navigational modes including but not limited to Walk, Fly, Swivel, and Adjust Distance.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	<p>Class Room/Computer Lab</p>	<p>Learner’s Guide, Handouts, Computer, Multimedia.</p>
<p>LU2: Research Three dimensional navigation</p>	<p>Demonstrate the procedure of functions of Camera including:</p> <ul style="list-style-type: none"> <li>• Creation</li> <li>• View</li> <li>• Preview</li> <li>• Properties</li> <li>• Plotting</li> <li>• Display</li> <li>• Adjust</li> <li>• Swivelling</li> <li>• Distance</li> </ul> <p>Demonstrate the procedure of parallel projection or perspective views by using a camera and target with the help of</p>	<p>Computer Lab</p>	<p>Learner’s Guide, Handouts, Computer, Multimedia.</p>

	<p>“DVIEW” command.</p> <p>Demonstrate the procedure of simulating walking and flying through a 3D drawing and their setting.</p> <p>Demonstrate the procedure of executing “ANIPATH” command for animation path.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>		
LU3: Inspect 3D Object	<p>Demonstrate the procedure of creating wireframe models by positioning 2D objects anywhere in 3D space i.e. 3D polylines.</p> <p>Demonstrate the procedure of drawing faceted surfaces using a polygonal mesh.</p> <p>Demonstrate the procedure of combining different simple shapes to create more complex solids by joining or subtracting them or finding their intersecting (overlapping) volume.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Computer Lab	Learner’s Guide, Handouts, Computer, Multimedia.

## Module 06: Produce 2D Solids and 3D Faces

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Inspect 2D Solids and 3D Faces	<p>Demonstrate the procedure of executing "SOLID" command with points to be filled.</p> <p>Demonstrate the procedure of executing "3DFACE" command with points to be filled.</p> <p>Demonstrate the procedure of making a three-dimensional polyface mesh vertex using "PFACE" command and pick points.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Computer Lab	Learner's Guide, Handouts, Computer, Multimedia.
LU2: Study Edge	<p>Demonstrate the procedure of creating edges</p> <p>Demonstrate the procedure of drawing 3D faces with invisible edges</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Computer Lab	Learner's Guide, Handouts, Computer, Multimedia.

<b>Module 07: Insert Surfaces</b>			
<b>Learning Unit</b>	<b>Suggested Teaching/ Learning Activities</b>	<b>Delivery Context</b>	<b>Media</b>
LU1: Know about Basic 3D surfaces	<p>Demonstrate the procedure of different Mesh primitive options.</p> <p>Demonstrate the procedure of creating smooth and refine Meshes.</p> <p>Demonstrate the procedure of editing existing Meshes.</p> <p>Demonstrate the procedure of converting Meshes.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Computer Lab	Learner's Guide, Handouts, Computer, Multimedia.
LU2: Comprehend Complex surfaces	<p>Demonstrate the procedure of developing different Surfaces (Revolved, Tabulated, Ruled, Edge, Extrude, and Offsetting).</p> <p>Demonstrate the procedure of editing Surfaces.</p> <p>Demonstrate the procedure of applying NURB controls on Surfaces.</p> <p>Demonstrate the procedure of analysing Surfaces.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Computer Lab	Learner's Guide, Handouts, Computer, Multimedia.

## Module 08: Develop Solids

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Create Solids	<p>Demonstrate the procedure of launching Solid primitives tab from 3D Modelling dropdown option of solids panel.</p> <p>Demonstrate the procedure of converting an existing line, 2D polyline, arc, or circle to a solid with a rectangular profile using “Polysolid” command.</p> <p>Demonstrate the procedure of creating unique solid primitives by extruding existing two-dimensional objects using “Extrude” command with</p> <ul style="list-style-type: none"> <li>• Taper</li> <li>• Path</li> </ul> <p>Demonstrate the procedure of executing following commands on Solids:</p> <ul style="list-style-type: none"> <li>• Revolve</li> <li>• Sweep</li> <li>• Loft</li> </ul> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Computer Lab	Learner’s Guide, Handouts, Computer, Multimedia.
LU2: Edit 3D	<p>Demonstrate the procedure of converting polylines and circles with thickness to 3D solids using “convtosolid” command.</p> <p>Demonstrate the procedure of converting polylines and circles with thickness to surfaces using “convtosurface” command.</p> <p>Demonstrate the procedure of editing the existing solids through;</p> <ul style="list-style-type: none"> <li>• 3D Move</li> <li>• 3D Rotate</li> <li>• 3D Align</li> <li>• 3D Mirror</li> <li>• 3D Rectangular Array</li> <li>• 3D Polar Array</li> </ul> <p>Demonstrate the procedure of extracting edges of a 3D object using “_xedges” command.</p> <p>Demonstrate the procedure of adjusting the smoothness of shaded and rendered</p>	Computer Lab	Learner’s Guide, Handouts, Computer, Multimedia.

	<p>objects using “FACETRES” command with valid values range.</p> <p>Demonstrate the procedure of applying “ISOLINES” and “REGEN” command to regenerate the 3D drawing in 3D view.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>		
LU3: Study Solid composites	<p>Demonstrate the procedure of applying following Composite functions on solids:</p> <ul style="list-style-type: none"> <li>• Union</li> <li>• Subtract</li> <li>• Intersect</li> </ul> <p>Demonstrate the procedure of creating 3D solid by thickening a surface using “THICKEN” command.</p> <p>Demonstrate the procedure of highlighting 3D solids that overlap using “INTERFERE” command.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Computer Lab	Learner’s Guide, Handouts, Computer, Multimedia.



## Module 09: Modify Solid Faces

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Modify Solid Faces	<p>Demonstrate the procedure of modifying solids face using</p> <ul style="list-style-type: none"> <li>• Taper</li> <li>• Extrude</li> <li>• Delete</li> <li>• Copy</li> <li>• Colour</li> </ul> <p>Demonstrate the procedure of applying “Imprint” facility on arcs, circles, lines, 2D and 3D poly lines, ellipses, sp lines, regions, bodies, and 3D solids object.</p> <p>Demonstrate the procedure of creating shell or a hollow thin wall with a specified thickness from 3D solid object.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Computer Lab	Learner’s Guide, Handouts, Computer, Multimedia.
LU2: Edit Solids	<p>Demonstrate the procedure of selecting and manipulating a selection set of more than one sub object on any number of solids that include more than one type of sub object using “CTRL” key to hold or toggle</p> <p>Demonstrate the procedure of constraining the movement or rotation of a selection set of objects to an axis or a plane using “Move” or “Rotate” command.</p> <p>Demonstrate the procedure of pressing or pulling bounded areas by pressing and holding CTRL +ALT, or by clicking the Press pull button on the dashboard and then picking the bounded area.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	Computer Lab	Learner’s Guide, Handouts, Computer, Multimedia.

## Module 10: Navigate Sections and merge Flat Objects from 3D Model

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
<p>LU1: Handle Section Objects</p>	<p>Demonstrate the procedure of creating section object that exposes the interior details of a model created with 3D objects using “SECTIONPLANE” command.</p> <p>Demonstrate the procedure of applying following options to manipulate Section using Grips:</p> <ul style="list-style-type: none"> <li>• Base grip</li> <li>• Directional arrow grip</li> <li>• Segment end grip</li> <li>• Menu grip</li> </ul> <p>Demonstrate the procedure of applying following commands on Section:</p> <ul style="list-style-type: none"> <li>• Erase</li> <li>• Move</li> <li>• Copy</li> <li>• Scale</li> <li>• Rotate</li> <li>• Draw order</li> </ul> <p>Demonstrate the procedure of generating 2D and 3D Sections using option of right click button of mouse.</p> <p>Demonstrate the procedure of using the intersection of a plane and solids to create a region using “Section” command.</p> <p>Demonstrate the procedure of applying “Slice” command on the 3D object.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>	<p>Computer Lab</p>	<p>Learner’s Guide, Handouts, Computer, Multimedia.</p>
<p>LU2: Handle Flat Objects</p>	<p>Demonstrate the procedure of creating 2D or “flattened” representation of all 3D objects in the current view using “flat shot’ command.</p> <p>Demonstrate the procedure of executing “SOLVIEW” command.</p> <p>Demonstrate the procedure of generating profiles and sections in viewports created with SOLVIEW using “SOLDRAW”</p>	<p>Computer Lab</p>	<p>Learner’s Guide, Handouts, Computer, Multimedia.</p>

	<p>command.</p> <ul style="list-style-type: none"><li>• Develop 3D view using UCS.</li><li>• Run "SOLPROF" command.</li></ul> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>		
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## Module 11: Customize Rendering, Materials and Lights

Learning Unit	Suggested Teaching/ Learning Activities	Delivery Context	Media
LU1: Study Rendering	<p>Demonstrate the procedure of creating a photorealistic or realistically shaded image of a three- dimensional wireframe or solid model using “Render” command.</p> <p>Demonstrate the procedure of determining the output site that the renderer uses to display the rendered image using “RPERF” command and selecting “Destination”.</p> <p>Demonstrate the procedure of determining the output quality that the renderer uses to display the rendered image using “RPERF” command and selecting “Quality level”.</p> <p>Demonstrate the procedure of controlling the parts of the model that gets processed during rendering for following three settings:</p> <ul style="list-style-type: none"> <li>• View</li> <li>• Crop</li> <li>• Selected</li> </ul> <p>Demonstrate the procedure of rendering cropped window using “RPERF” command and selecting “Procedure”.</p> <p>Demonstrate the procedure of executing the process to Render to File and Turn off Render to File.</p> <p>Demonstrate the procedure of using environmental features to set up atmospheric effects or background images using “RENDERENVIRONMENT” command.</p> <p>Demonstrate the procedure of applying following Backgrounds:</p> <ul style="list-style-type: none"> <li>• Single colour</li> <li>• Multi-colour gradient</li> <li>• Bitmap image</li> </ul> <p>Demonstrate the procedure of using “View” command and later selecting “New”.</p> <p>Demonstrate the procedure of defining settings that affect how materials are</p>	<p>Class Room/Computer Lab</p>	<p>Learner’s Guide, Handouts, Computer, Multimedia.</p>

	<p>handled by the renderer as:</p> <ul style="list-style-type: none"> <li>• Apply Materials</li> <li>• Texture Filtering</li> <li>• Force 2-Sided</li> </ul> <p>Demonstrate the procedure of executing renderer controls sampling by allocating values to;</p> <ul style="list-style-type: none"> <li>• Min Samples</li> <li>• Max Samples</li> </ul> <p>Filter Type</p> <ul style="list-style-type: none"> <li>• Filter Width and Filter Height</li> <li>• Contrast colour</li> <li>• Contrast Alpha</li> </ul> <p>Demonstrate the procedure of applying settings that affect how shadows appear in the rendered image in Simple, Sort, or Segments modes.</p> <p>Demonstrate the procedure of applying settings that affect the shading of a rendered image (Ray tracing) with following options;</p> <ul style="list-style-type: none"> <li>• Enable</li> <li>• Max Depth</li> <li>• Max Reflection</li> <li>• Max Refraction</li> </ul> <p>Demonstrate the procedure of showing how scene is illuminated with the following options:</p> <ul style="list-style-type: none"> <li>• Enable</li> <li>• Radius</li> <li>• Max Depth</li> <li>• Max Reflection</li> <li>• Max Refraction</li> </ul> <p>Explain “Diagnostic” and “Processing” features.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>		
LU2: Employ Materials	<p>Demonstrate the procedure of adding material to drawing using “Materials” or “Marbrowseropen” commands.</p> <p>Demonstrate the procedure of applying Material by layers using</p>	Computer Lab	Learner’s Guide, Handouts, Computer, Multimedia.

	<p>“MATERIALATTACH” command.</p> <p>Demonstrate the procedure of creating own Material e.g. photo.</p> <p>Demonstrate the procedure of achieving Material mapping of photo or shapes using “MATERIALMAP” command.</p> <p>Demonstrate the procedure of configuring “Cut out Materials” procedure.</p> <p>Demonstrate the procedure of applying “Bump Map” option of the Material command.</p> <p>Demonstrate the procedure of executing “_VSMATERIALMODE” command to On/Off Materials.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>		
<p>LU3: Employ Lights</p>	<p>Demonstrate the procedure of turning On/Off the default Lighting using “DEFAULTLIGHTING” command.</p> <p>Demonstrate the procedure of executing command “POINTLIGHT” that radiates light in all directions from its location.</p> <p>Demonstrate the procedure of executing command “SPOTLIGHT” that emits a directional cone of light.</p> <p>Demonstrate the procedure of modifying Lights in a drawing using “LIGHTLIST” command.</p> <p>Demonstrate the procedure of customizing Photometric (light energy” light for lighting units, Luminaries, Weblight, Halogen effect, Candela intensity, etc.</p> <p>Demonstrate the procedure of applying the available functionality of Lights tool palette by pressing CTRL+3.</p> <p>Demonstrate the procedure of displaying uniform parallel light rays in one direction only using “DISTANTLIGHT” command and mentioning from and to points.</p> <p>Demonstrate the procedure of incorporating natural light based on</p>	<p>Computer Lab</p>	<p>Learner’s Guide, Handouts, Computer, Multimedia.</p>

	<p>climate into the drawing by specifying the latitude and longitude of a location for the sunlight using "GEOGRAPHICLOCATION" command.</p> <p>Demonstrate the procedure of adjusting the Sun properties using the "SUNPROPERTIES" command.</p> <p>Ask learners to practice in small groups.</p> <p>Summarize the lecture.</p> <p>Arrange Question/Answer Session.</p>		
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