

E U E R A S M U S V R / A R



# TECHNICAL DRAWINGS

## TD3: DIMENSIONAL, SHAFT AND HOLE TOLERANCES

### Authors

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# Introduction

This module addresses the use of low cost mobile Virtual and Augmented Reality (V/AR) tools developed with the support of animation and simulation tools alongside text based teaching methods. This unit was produced by the results of an international needs analysis of Technical Drawings training requirements conducted to determine the subject areas lacking in teaching the concepts of basic, advanced standards and principles used in manufacturing and engineering.

The main purpose of this curriculum development study was to develop a competency-based and target-oriented Technical Drawings training programme with the collaboration with the academic and the industrial partners. That's is why it was concluded that not only current teaching methods have led to a deficit in the quality of Technical Drawings training but also using up to date V/AR and animation technologies could help to improve it.

It is envisaged that the use of V/AR technologies, which will help to gain skills for visual memory during these advanced studies, will make a significant contribution to the learning performance of the trainee.

## How to Use

### **Use of Animations:**

Users first watch related video or animation/visualization to understand basis of the subjects.

**Use of AR apps:** A virtual object would be superimposed over a live video feed from a camera of a mobile device. The use of ARCore can only work with new mobile phones that have (Android 7.0+).

**Use of VR apps:** The requirements for the student/teacher for VR apps would be: HTC VIVE Virtual Reality System or VR Glasses

These animation and A/VR applications can be found at the project web site and can be downloaded free.

<http://vrindesign.org/>

# VRINDESIGN TECHNICAL DRAWINGS

**Module Code: TD3**

## **Module Title: DIMENSIONAL, SHAFT AND HOLE TOLERANCES**

<b>Course Content</b>	<p><b>Dimensional tolerances</b></p> <p>Types of the tolerances for linear and angular dimensions used in technical drawings. Selection of dimensional tolerances according to manufacturing type using relevant standards.</p> <p><b>Edge Tolerances</b></p> <p>Symbols and display methodology of edge tolerances. Edge tolerance and difference of chamfer and radius concepts.</p> <p><b>Shaft and hole tolerances</b></p> <p>Shaft and hole tolerances and fitting tolerances used in this tolerance group. Nominal size, Maximum size, Smallest size, Down size difference, Up size difference, Maximum and minimum size. Reading the tolerance tables, choosing the appropriate tolerance according to tolerance table ISO.</p>	
<b>Learning Outcomes</b>	3.1	<p><b>Learners</b></p> <p>Can show and read tolerances for linear and angular dimensions used in technical drawings.</p>
	3.2	<p><b>Learners</b></p> <p>Can be select dimension tolerances using the relevant standards or the group of tolerances can found from the standard depending on the type of manufacture.</p>
	3.3	<p><b>Learners</b></p> <p>Can display the methodology of the edge tolerances. They can aware of the difference between edge tolerance and chamfer or radius concepts.</p>
	3.4	<p><b>Learners</b></p> <p>Know shaft and hole tolerances and tolerances used in this tolerance group. They know the clearance fit guide &amp; descriptions and select from the ISO standard table.</p>

	3.5	<p><b>Learners</b></p> <p>Read the ISO standard for shaft and hole tolerances using tolerance tables. Selects the appropriate shaft and hole tolerance according to the related part usage type.</p>
<b>Course hours</b>	60 min	
<b>V/AR Content</b>	<p><b>Video / Animation</b></p> <p><b>Mobile AR Application</b></p> <p><b>VR with HTC Vive app</b></p>	
<b>Teaching Learning Methods</b>	<p><b>Teaching Methods for Trainers</b></p> <p>These applications and animations should be used as supporting materials during theoretical lecture to teach the course content. Suggested methods are:</p> <ul style="list-style-type: none"> <li>- Use general PowerPoint slides to teach theoretical content,</li> <li>- Use /show related video or animation where the related subject presentation to visualization can be shown,</li> <li>- Learners can use their own AR apps to create these subjects as 3D environment if possible,</li> <li>- Or use AR apps via projections to show the details to the learners,</li> <li>- Learners can use their own mobile device to see related VR apps to create these subjects as 3D environment via using VR glasses</li> <li>- Or trainers can use VR apps via HTC vive with the learners to understand related subject as 3D environment</li> </ul> <p><b>Learning Methods for Individual Users</b></p> <ul style="list-style-type: none"> <li>- Firstly watch related video or animation / visualization and understand basis of the subjects.</li> <li>- Use your AR apps to create these subjects in 3D environment</li> <li>- Use your mobile device to see related VR apps to practice these subjects as 3D environment via using VR glasses</li> </ul>	