**Lecture (19)**

**Vorticity**

**19.1 Vorticity definition الدردورية**

The angular velocity is a measure of rotation of a body. This is suitable quantity for a body that retains its shape but a fluid can distort and we must consider two components to rotation: shear and curvature. We intoduce the term vorticity as a measure of rotation within a fluid.

**19.1.1 Shear**

n

v

t2

t1

**Figure 19.1 Fluid elements moving in a straight line but at different speeds**

Consider a marker in the fluid such as the dashed line crossing the streamlines. Initially, the marker might be normal to the streamlines, as at time t1, but later will be rotated to the position at t2. The marker line has undergone an anticlockwise rotation (cyclonic in the N-hemisphere). We evaluate the contribution to the vorticity as $-\frac{dv}{dn}$

**19.1.2 Curvature**

r

v