Mechanics of Material
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Constitutive relation, strain energy and potential
Lecture – 40
Shear Modulus

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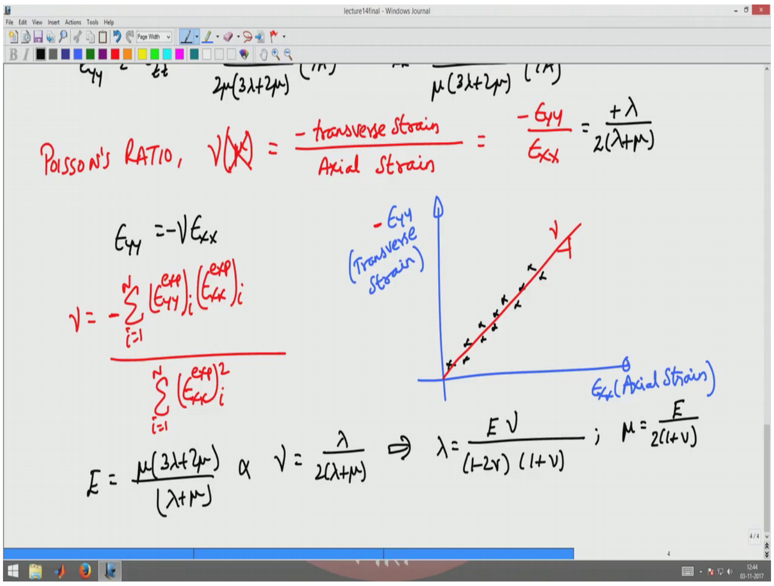

Now, it is not that we use only these 2 this in axial exponent alone to find the metal parameters of a material the other experiments and other modulus which are also used one of the program modulus that is used this, what is called as the Shear Modulus.

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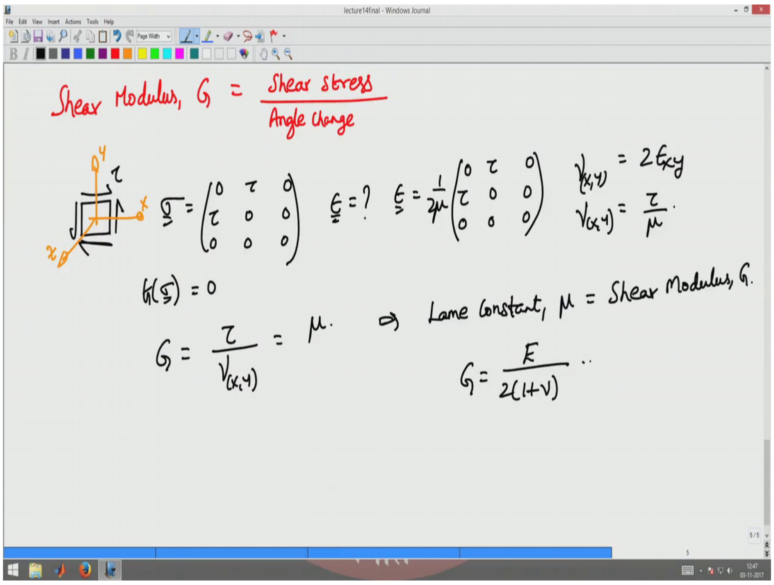

G which is defined as the Shear stress by divided by the Angle change caused due to the shear stress now here what you do is you do a pure shear experiment where in you take a block and you shear it like this with that shear stress tau now what happens is your state of stress is given by 0 if I assume my coordinate system to be x y and z that is as my coordinate system my state of stress for this particular state of stress is 0 tau 0 tau 0 0 0 0 0 correspondingly you will find that the strain from the constellation we want to find what the strain is you observe that trace of sigma in this case is 0. So, the strain becomes. So, the strain becomes one by 2 mu sigma which is 0 tau 0 tau 0 0 0 0 0.

From the previous lecture on angle changes you know that the angle change gamma between x and y axis between the x and y axis is given by 2 times epsilon xy. So, the angle change in terms of stress would be now tau by mu gamma x comma y and angle changing between the x and y axis for this state of shear stress.

So, the shear modulus G is nothing, but tau divided by gamma between x comma y axis which is nothing, but mu. From here you get to understand that the Lame Constant mu, mu is nothing, but the shear modulus G, now from the expression for mu that we had before you can relate the shear modulus to the young's modulus also through the equation E by 2 into 1 plus nu from the previous expression that we had for mu Lame Constant.