Structural Geology
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Lab Session
Graphical Problem
Lecture No 45

Hello everyone, welcome once again to online course of structural geology in NPTEL. This is the last week and you already are familiar with the concept of strike line, stratum contour, plan views. So with help of those we will start a new series of problems, experimental problems and that would be graphical problems.

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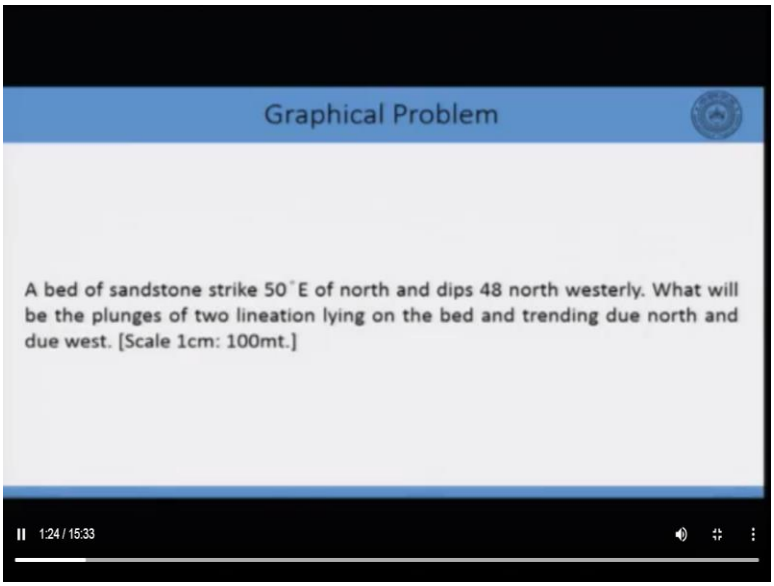

So in the first problem, we have a orientation of bed and without the use of stereo net or stereographic projection techniques just in a plain paper using our conventional biaxial diagram that we have learnt through 11 and 12 and also in graduate studies, we will find out the plunge of two lineations on a bed whose orientation is known. The question reads as follows, a bed of sand stone strike 50 degree east of north and for dips 48 degree northwesterly. What will be the plunges of two lineation lying on the bed and trending due north and due west respectively, the scale of the problem is 1 centimeter is to 100 meter.

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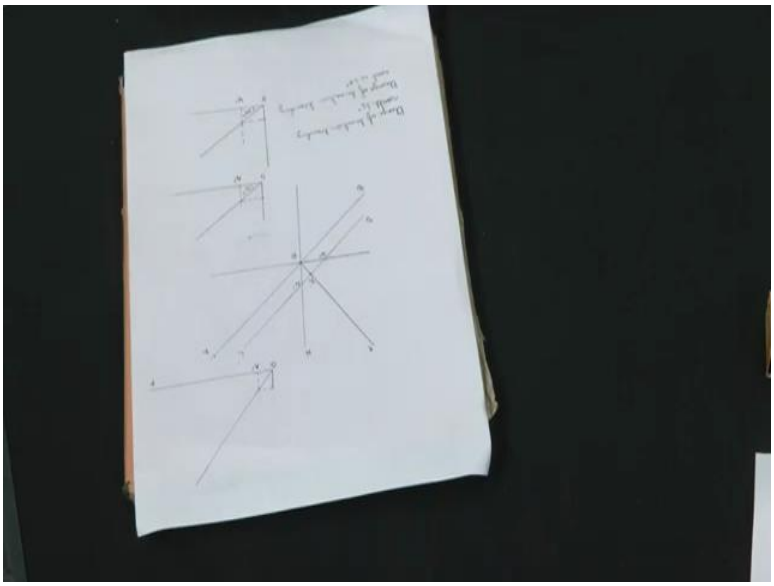

So now we have a blank paper and in this blank paper the first thing we will do is that we will fix the coordinate system. So our coordinate system will be conventional as we draw biaxial XY diagram. So this is our coordinate system, fixed coordinate system and suppose we name the origin as O. Now we know that the bed dips 50 degree from north towards east, clearly, we have to fix the north. Conventionally we fix the north as the top of this line.

Now we will calculate 50 degree from north towards east. We obtain a point and then we join this point with the origin. So we will consider this line, suppose I name this line AB passing through the origin as the 0 meter strike line or stratum contour of the bed.

Now if this is a 0-meter strike or line or stratum contour of the bed, we draw the direction perpendicular to this line AB and suppose I name this line OP. So clearly OP is my direction of true deep. Now I know the scale of the problem is 1-centimeter equals to 100 meters and I also know the deep of my bed is 48 degrees. So clearly if I have to now find a point in the line OP and then even, I find the point I have to draw a line parallel to AB which will be another strike line or the stratum contour and so from 2 strike lines or stratum contour, clearly, we will get the orientation of the bed.

Now to find out the point corresponding to the 100 meters strike line or stratum contour we know that the deep of the bed is 48 degrees. So what we do is that we first draw a line over here. We now construct a subsidiary diagram where I draw this line. Now I mark the 48 degrees. So in this diagram I join these 2.

I also know that the vertical separation is 100 meters if I want to draw the 100-meter strike line. So now the 100 meters according to scale is basically 1 centimeter. So what we do is that I rotate this thing entirely to draw this, so clearly this corresponds to 100 meters. Now if I draw a line parallel to this line horizontal line from these 100 meters, it will clearly intersect the deep line, which I have drawn.

And then if I project the point, I obtained in the deep line perpendicular to the horizontal line and parallel to the vertical line, I will obtain a point in the horizontal line. So clearly, the distance between this and the point I obtain will be my horizontal separation in plain view. So we will do the task right now. So what we will do is that we will first project the vertical 100 meters distance to the deep line.

Now what we will do is that I again rotate this thing for my convenience. Now I again rotate to bring it to the original position. So suppose, this is my OP line and clearly this point which I can call A dash so OA dash is the distance in the OP line to construct our 100 meters strike line or the stratum contour because OA dash is the horizontal plan spacing of the 100 meter strike line.

So it is better to use a divider as we do not have a divider in this case we are taking the distance with the scale. So now I will draw a line parallel to AB and passing through the point I obtained. Clearly this N dash I name these two points, N dash and W dash. So, ON dash will be any lineation that is trending towards north and OW dash will be any lineation that is trending towards west.

Now ON Dash is the plan separation of that lineation and we know that the distance between ON dash is 100 meters originally. Because this line if I represent it as CD, CD is the 100-meter strike line. So now in order to find out the plunge of lineation that is trending north and containing in this bed. So what we will do is that we will again construct a subsidiary diagram that I am doing below.

And in that I will take the horizontal distance or the horizontal separation of ON dash and that is around 1 point. Now similarly I construct the biaxial diagram I know the vertical separation is 100 meters. So, ON dash is the plan spacing of any lineation content in the concerned plane and trending due north. Now to find out the deep angle we do a similar proceeding. For my convenience I rotate this paper to draw the lines and similarly I draw a line parallel to ON dash from the 100-meter point.

Now if I join the origin and the intersection of these 2 lines, then I will obtain another straight line which makes an angle with the horizontal and clearly this angle will represent the plunge of the lineation content in this concerned bed and trending due north because this is our plan separation and this is our vertical separation.

So when we project the plan and vertical separation and come to a point where the horizontal and the vertical separation meet, so when we join that point with the origin the angle it makes will clearly be the plunge. So this is our plunge angle trending due north and I measure it with a protector and the angle comes out to be around 36 degrees.

In the similar process, we will do find out the plunge of any lineation that trends due west. We will first take its horizontal separation or the plan separation to be precise and then construct a subsidiary diagram. The plan separation is this, this is O this is W dash and then again, we rotate the paper for our drawing convenience and mark the vertical separation according to scale which is 100 meters strike line.

Now, we do the similar case, we just project the other way round. Now clearly, I join O with our obtained point and then again measure the angle with a conventional protractor. The angle comes out to be 34 degrees. So for this problem the plunge of lineation trending north contained in this concerned plane is 36 degree and plunge of lineation trending west is 34 degrees.

So, now we know that if we do not have a stereo net and have the orientation of a plane and 2 lineations contained within the plan how to determine their plunge when we know their trends. And this process without constructing the geometrical attributes of a plane without help of a stereo net is called graphical problems.