Technical Arts 101
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Lecture - 28
Think and Analyze

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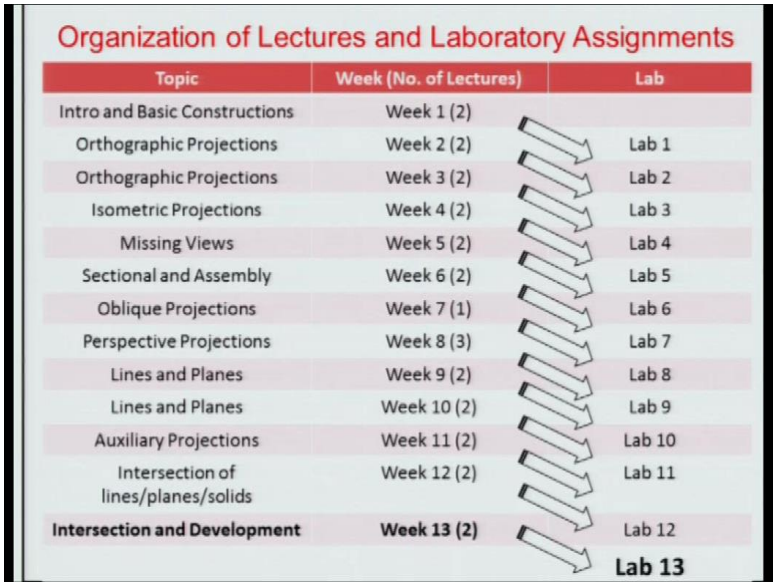

Development of surfaces which are non-developable or oblique. So, these are the surfaces that you cannot cut and lay down flat on a piece of well, lay down flat on a plane. So, we need to pursue or follow some tricks in this, so that is one development.

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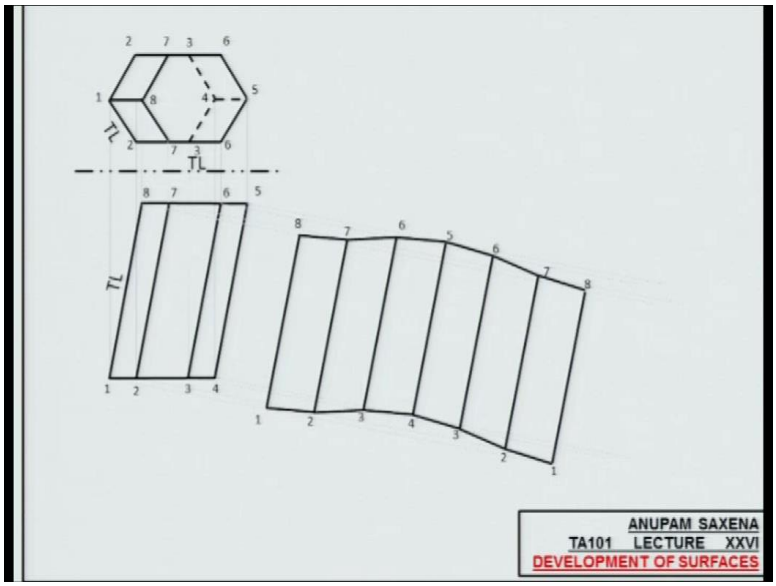

So, let us look at this sheared hexagonal pyramid the top view shown and this is the front view it is kinds of sheared. So, what you do is you you actually have your solid like this, it just kind of shear the top surface with respect to the bottom surface that is how the solid is. And we would like develop it, step one in development always look for true lengths, true shapes because unless you do that it will be difficult for you to a develop any solid alright. So, you got how many edges one, two, three, four, four that you see and two are behind. So, one, two, three and four, so these are the edges that you see, and then two edges are behind these two edges. can you identify edges in true length. If so, which ones are those?

Students: (( ))

Professor: Come again.

Students: (( ))

Professor: Six, five, so this the true length because this projections horizontal what else?

Students: Six seven.

Professor: Six seven well that is the true length also, because horizontal horizontal once again any other?

Students: One eight.

Professor: One eight, you see this projection and the corresponding projection for this is horizontal over there. So, you have bunch of edges which are in true length. And if you want to develop this how would you want to go about this, how would you want to go about developing the surface. Well start with a hinge line you know that edge one eight is in true length and if you kind of cut, your solid let us say at this edge, if you cut this solid at edge one eight, and open it up perpendicular to this. This is how your vertices is one two three four and five six seven eight will appear. They will be appearing on these corresponding projections.

So, once again scissor this edge open this surface out these vertices are going to be appearing on the respective projections. So, once you have figured these projections out, start with edge one eight and follow the connectivity one eight is connected to what. So, one is connected to two, eight is connected to seven two and seven they are connected. So, follow this connectivity in from from both the views. From eight what do we have, seven; and this length is the same as this length. And this length from one, what do we have two and this length is in true length of course. So you got two here, but seven here two and seven are connected and keep going forward. Two is connected to what three two three, and seven is connected to what six. So, you can figure the true lengths of seven six and two three, keep going forward because six seven is going to be in true length both the projections are horizontal and so on. This is the relatively together example, one eight to one eight fine. Well an trivial example nothing very rocket science about this.

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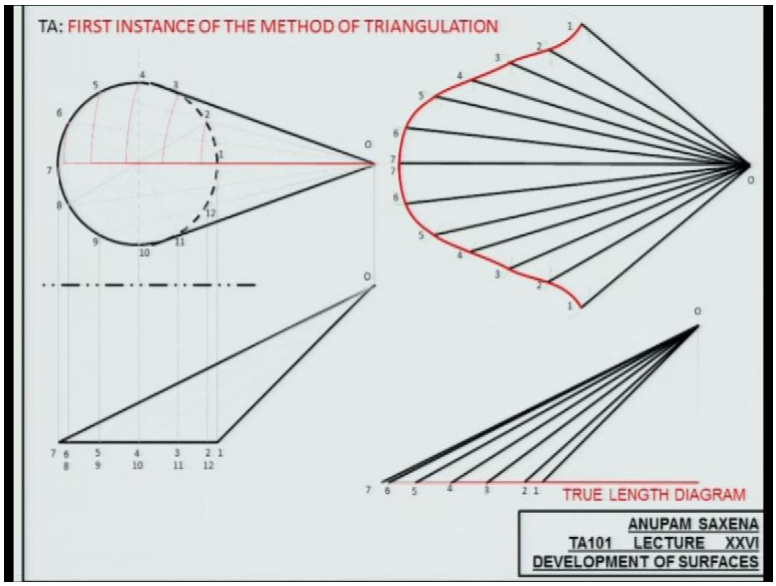

We are looking cone.

Students: (( ))

Professor: What about the, what about the word.

Students: (( ))

Professor: Well, so if you want to consider this to be an open a solid just the surface then you do not have to worry about the legs or if you want to consider that to be. So, we are looking cone, the apex is shifted not martially, but really in a viewed fashion, and we would like to develop this. Now is it possible for you to develop this viewed looking cones the same way as you are developed a regular point, is it possible? Once again, is it possible for you to develop this cone the same way as you develop a regular cone.

Yes, assuming that is not possible for you to develop this surface. You know in a regular fashion what you do? You approximate the surface and the way to approximate the surface is via triangulation, is possible to develop the surface accurately may be not. So, you need to go for approximate development, and the way to do that is to triangulate the surface and this is how divide the base into equal number of parts, label these vertices one to twelve, and draw generators from each of these vertices to join the apex.

So, project those once you down onto the front view, the apex over here of the cone is o, join each of these vertices to that apex. So, the surface of this viewed looking cone is now approximated by a bunch of triangles on the surface of this solid, to develop this cone now implies have you this triangles. And the same procedure try to figure the true lengths or true dimensions from both of the views. So, we will be leading a true length diagram, to figure out the true lengths of these edges zero one, zero two, zero three up to zero twelve and of course, one, two, three, four, five, six, seven, eight and so on and so far.

Now look at this segment here eight nine not the arc, but the segment, line segment would that be in true length. How about six seven would this be in true length? So in fact, all these line segment shown in these vertices there will be true length because the corresponding projections in the front view all are horizontal. Step one clear; step two, how do we figure the true lengths of zero one, zero two, zero three up to zero twelve is about the questions. And for that we need the true lengths diagram. Now look at zero one, and look at the corresponding projection in the front view, is that in true length. Look at zero seven and look at the corresponding projection of zero seven in the front view is that in true length. Zero one is in true length and zero seven is in true length.

Well start with a right angle triangle that I have drawn over there. To find the true lengths of the rest of these segments what you do?

Students: (( ))

Professor: Method of rotation, so rotate zero two to lie on the horizontal, take it is projection down or measure this length, take it is projection down over here. And what would you do transfer this projection over here directly, and this is zero two in true length. Likewise, zero three measure this length, transfer it down here and join vertex three to zero, and then give you the true length of zero three. And so what the same procedure for zero four, zero five, zero six simple - method of rotation. Measure these guys, transfer them on to the true length diagram that is in true length, that is in true length, that is in true length, and that is in true length.

So, once you have the true lengths of zero i(s) where i goes from one to twelve and all these are the guys you can start developing the surface. And this is how start with zero seven. Draw an arc with the radius the same as seven eight or seven six depending on

which side you are developing surface seven six. So, this distance is same as this distance and then to get this length, you need to choose what distance from here up to here, six fixed. Number five with this distance cut an arc; and with zero five, cut another arc with this point is center five located and continue. So, this is not a true development, but an approximate development.

And the way we did that way we performed this development is to triangulations. We are approximated the surface of the solid by means of bunch of triangles by means of a set of triangles as simple is that, and everybody with me?

Students: Yes sir

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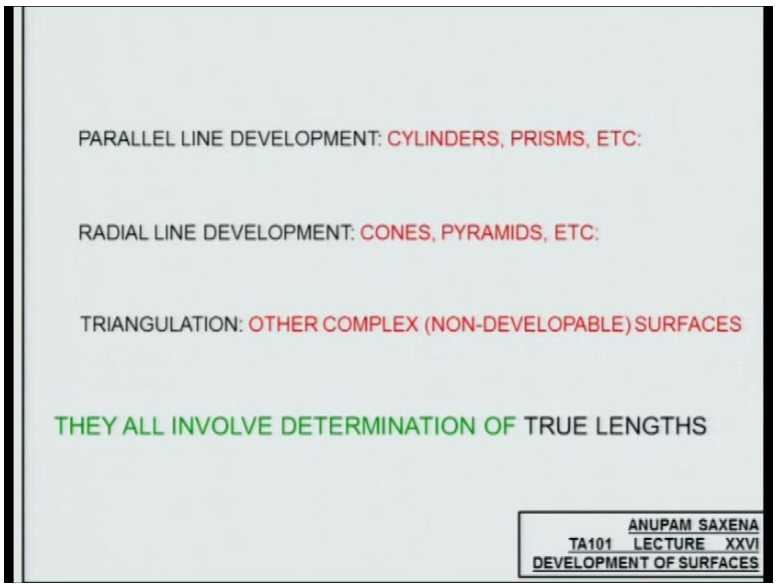

Professor: Better, first example of the method of triangulations. So, if you remember a discussion last time on Tuesday, you go for parallel line development in case of a cylinders prisms etcetera, those kind of surfaces solids. You go for radial line development in case of cones, pyramids, regular solids, cones pyramids. And you go for triangulation for other complex or non developable surfaces like in the previous example. As I said last time, they all some way or the other involve determination of true lengths and true shapes; without that you cannot do anything.

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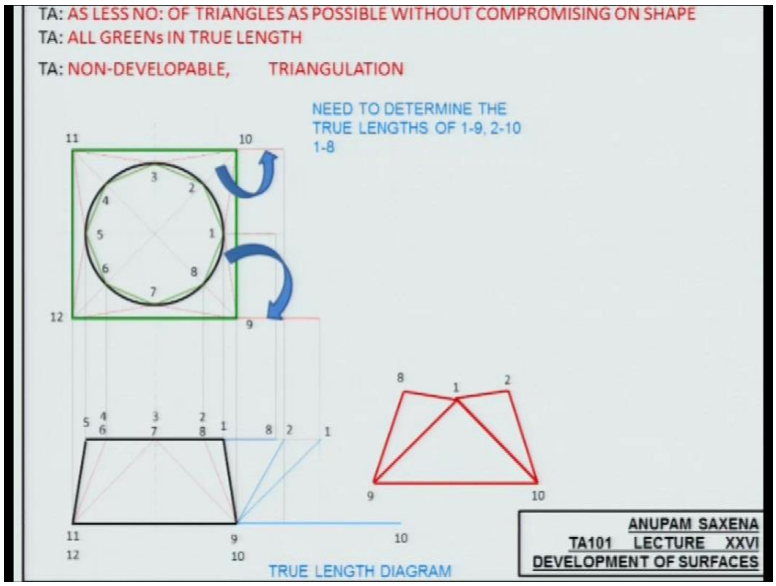

This is another very interesting solid. The front view given the top view given, this cross section is circular, this cross section is rectangular or square. So, this surface is actually a blend between the circular cross section and a rectangular cross sections. Can you imagine this?

Students: Yes sir

Professor: A linear blend between two different shape cross sections, how do we develop this? How do we develop this triangulate.

Students: (( ))

Professor: No that is manufacturing that is not developing, you are far ahead of me. First thing you have to develop this and then in your TA 201, if you get chance to make this then make that. So, we triangulate the surface, it is a non-developable surface, we triangulate that, and the way we do that is we divide the circular cross section to bunch of paths. And we actually work with four vertices of the square and we join these vertices in such a way that we get triangles approximating the surfaces over here, and the surface over here. Look at the way I am joining the triangles now, I am joining these vertices together triangles

You follow the red lines, bunch of triangles easier to work with top view, just transfer the triangles onto the front view. So, of course, I am approximating these this, this curve

by a bunch of linear segment also. So, triangles 11 3 4, 11 4 5, 5 6 12, 6 7 12, 7 12 9, 7 8 9, 1 8 9, 1 9 10 and so on and so forth. They all approximate the surface. Transfer the vertices on to the front view, and transfer the connectivity as well on to the front view. The trick is or the a notion is to work with as less number of triangles as possible, but necessary enough number of triangles that would allow you to develop this surface properly. so you do not want to compromise in the shape the surface.

What do we need next, the true lengths for that we need the true lengths diagram. Notice that all these green edges, they happen to be true lengths about the rest. What do you have to say about the lengths of eight nine to ten eleven four six twelve are they the same?

Students: Yes sir

Professor: What

Students: (( ))

Professor: Same but?

Students: (( ))

Professor: Of course, but the true lengths of these edges will be the same. The true lengths of these edges 2 10, 4 11, 6 12, and 8 9 they would be the same. And likewise the true lengths of 1 10, 1 9, 9 7, 7 12, 12 5, 5 11, 11 3, 3 10, they will all be the same. So, we need to find the true lengths of only a set of lines and will be happy with that. All greens in true lengths that is need to determine the true lengths of edges like one nine two ten and one eight. So, I am going to be preparing my true length diagram over here; length nine ten is in true length length nine ten is in true length. To get the true length of one nine, I would to take this projection of one nine in the top view, so that this projection becomes horizontal and then I would project that down on to the front view and this length one nine will then remain true length. Method of rotation are simple as that.

To get the true length of two ten, I would rotate two ten, so that two ten becomes horizontal. So, this guy here I have rotated about vertex nine, this guy here I have rotated about vertex ten. So, two ten becomes horizontal I will take the projections down, I take

that projection down and ten sorry two is here. So, this guy here that would be my true length two ten. What else am I left with one eight, one eight is already in true length, I do not need to worry about that, but if I still want to figure out the true length of that. I rotate one eight about one take its projections down and this is my true length one eight.

So, once I have the true lengths of all the edges of these triangles that approximate the surface. I am ready to develop the surface take a compass take a pencil and get started start with nine ten, and of course, when you are developing make sure that you are following the connectivity here and here following the topology. Nine is connected to what, nine is connected to eight, nine is connected to one. So, which triangle am I going for first. I start with nine ten, I start with nine ten, I will go with nine one, and I will go with ten one.

So, this triangle is something that I have now on my two dimension plane, nine ten, nine one, one ten which triangle now perhaps one to ten. With one as the center one two is the length draw an arc with ten as the center, ten two as the length draw another arc you will get a triangle or you could go with one eight nine, one eight nine is here same thing. So, we have vertex nine here, with this length eight nine, with nine as center draw an arc biggest length one eight, with center drawn another arc you will get eight and keep on following this procedure. We get one to ten make sure that you are following the connect connectivity right one to ten and then next triangle would be two three ten and the next one to be. Three ten eleven next one three four eleven and then eleven four five keep on continuing this is straightforward.

So, the challenging part for you is this true length diagram and understanding the that you have to approximate a non developing surface using a set of triangles.

Student: (( ))

Professor: You cannot the cutting of the circle is not a problem, but you are question has a context what is the context

Student: (( ))

Professor: Yeah

Student: (( ))

Professor: Not not the sheared well sheared cone yes yes yes

Student: (( ))

Professor: Well the accuracy of development will depend on the number of the triangles we used to represent the surface, the more than number of triangles you use the better the accuracy of this development.

Student: (( ))

Professor: Again so merely cutting out of the circle out of a piece of a paper is not a problem. So, if you just want to cut this circle out from piece of paper perfectly fine, but if you are wanting to cut this circle with reference to the entire surface around it that is the context. Now look at all these vertices lying on the circle one, two, three, four, five, six, seven, eight, one, two, three, four, five, six, seven, eight and then you have of course, have a one more triangle over here I think yeah right. So, these guys where would they lie.

Student: (( ))

Professor: So if you close, if you glue this nine eight with that nine eight and if you kind of close the surface all those guys there will be approximating the circle from this example. So, my point is if you want so if I answer your question correctly if you want this part of the surface to the a précised circle is this what you want? If you want this part of surface to be a précised circle, you will have to have more number of points approximating that circle.

Student: (( ))

Professor: Well I mean you have to account for those points by means of triangles those points on this circular here they have to participate in triangles they have to be a part of this triangles. Thinking and analyzing means well you have lot number thirteen and then you have your exam that are not end and even after this course your thinking and analyzing should not end c for?

Students: Continues.

Professor: M for?

Students: (( ))

Professor: Did not you say m for mid sems, m for marks, m for money m for what

Students: (( ))

Professor: C for what?

Students: Math

Professor: C for?

Students: (( ))

Professor: Choco, this is brahma gang, brahma gang nothing do with 101, but if it do we thinking and analyzing that I will share with you. If you want to take it take it if you do not want take it fine, c for contentment satisfaction one word that each and every one of you is looking for though out of your life.

Students: Yes sir.

Professor: If does anybody disagree? C for contentment, c for currency – money, many of you guys think the more money have in your pocket, no more content you are is that true? Louder.

Students: No sir.

Professor: Not true, but still trust me once you in your fourth year, you are going to the companies you are going to paying you high, which you should not. We should be going for companies that offer you job of your choice, C for choice, your choice has where things change. The more choices you make the more confident you get, c for confidence; the more choices you make the more confidence you get in life the more compromise you make, compromises would be like without you wanting to do something you force do something some way or other. The more compromises you make the less confidence you get. Two factors which are going to be important through of life after your twenty six or twenty seven may be later carrier c, your spouse, your companion c. Your life that revolve around these two factors you choose the right carrier your content you choose

the right companion your content you choose the wrong carrier, you choose a wrong spouse or companion.

C words children, direct source of contentment look at one year old you have to hold him or her in your hands. C for college you can figure out a bunch of c words that if you cogitate about if you think and analyze, and this is why perhaps subconsciously I need this course think and analyze 101. So, if you think and analyze about these bunch of c words, you will see how these words might change your life a turn keep.

Finally you always said you know the is not good, you are doing know, it is a democratic country I can say whatever I want well within limits. So, you guys tend to change your people, you guys blame people, you know the things which are not right around. You guys want to change, c word you guys want to change for things on to be better and you are the change. You take a right step forward and the world will follow you. You do not wait for world to take the right step forward and then you follow the world see other way on you take the right step forward and the world follows brahma gang impressed.

Students: (( ))

Professor: Impede take an end. So, that is it lab number thirteen is on your exams or on on the twenty sixth, nine to one, a single minute late doors are closed; keep that in mind for both batches. No sharing of equipment, information anything during the exam hall in between when the batches are getting or with the batches are in transition. Anything else? Was the pleasure teaching you and for that thank you in Advance.