Crystals, Symmetry and Tensors
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Lecture 2d
Line of interaction between two planes

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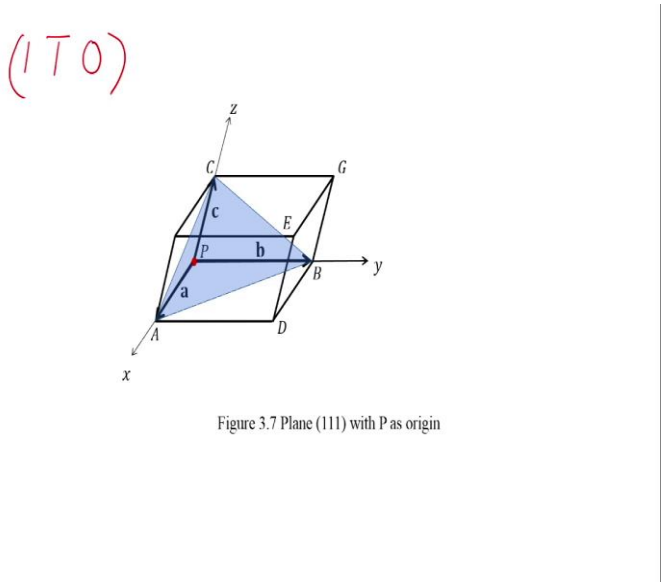

Figure 3.7 Plane (111) with P as origin

So, this is 1 1 1 plane with P as origin. Now, include in this 1, 1 bar, 0 plane also, just now you made that plane. So, include a 1, 1 bar, 0 plane in this. Make this drawing and include 1, 1 bar, 0 plane. And then tell me what is the line of intersection, miller indices of line of intersection? So, problem.

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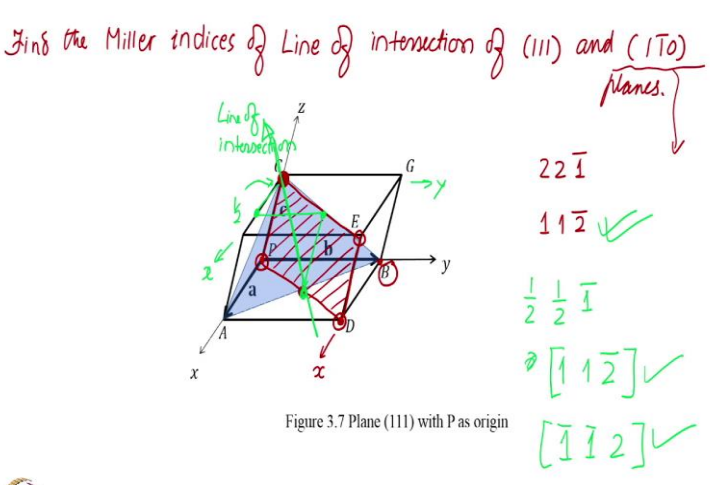

Figure 3.7 Plane (111) with P as origin

So, draw both the planes, one plane is already drawn for you. And draw, in the same unit set to draw another plane that is 1, 1 bar, 0. You already saw that plane in the previous one, you can try to draw this here. And then try to observe what are, what is the common direction?

Student: 2, 2, 1 bar.

Professor Rajesh Prasad: Um?

Student: 2, 2, 1 bar.

Professor Rajesh Prasad: 2, 2, 1 bar. What is a nice choice for origin of 1, 1 bar, 0? So, B is a nice choice. So, from B you can easily draw 1, 1 bar, 0. So, 1 from B will be where, one from B?

Student: At point D.

Professor Rajesh Prasad: At point D. So, D is a point, D is a point on my plane.

Student: (())(02:29). 1, 1, 2 bar. 1, 1, 2 bar.

Professor Rajesh Prasad: 1, 1?

Student: 2 bar.

Professor Rajesh Prasad: Some permutation of this answer 1, 1, 2 bar. So, this is the point on the plane, this is my origin, this is my origin, this is a point on the plane because it is cutting out at 1 on the x axis, on the y axis it is cutting minus 1, so this is another point on the plane. So, this is a point on the plane, this is a point on the plane. On z axis it is 0 means it is parallel to the z axis. So, from these points, I draw a line parallel to the z axis.

So, I go that way. So, I have find two more points on the plane. Since, I have four points three points were sufficient to define a plane. I have four points, so I can nicely draw my 1 1 1 plane. So, this becomes my 1 1 1 plane, sorry 1, bar 1, 0 plane. Now, you have to find the line of intersection. So, you have to look for points which are common. Which are the points which are common?

Student: C point and the midpoint of the (())(04:15).

Professor Rajesh Prasad: So, C, C is on the both the planes. So, C is a point of, C should lie on that line of intersection. And the center of the bottom face is also on both the plane. So,

that is also on the line of intersection. And two points are sufficient to define my line of intersection. So, I get my line of intersection as the line going from C to this, this becomes my line of intersection. So, geometrically I have found it. All I have to do now is to find its miller indices. So, for miller indices what will be the convenient origin?

Student: C.

Professor Rajesh Prasad: C, so, from C, I want to go to this bottom face center. So, from C the x axis is coming here, y axis is coming here, and z is going that way. So, since I want to reach the face center, I have to go only half in the x direction.

Student: (())(05:27).

Professor Rajesh Prasad: So, half here, half in the y direction will bring it, bring me to the top face center, and then I have to travel 1 down. So, half, half.

Student: Minus 1.

Professor Rajesh Prasad: 1 down. And I do not like fractions, so I multiply by 2, I get 1 1 2 bar, so 1 1 2 bar was the right answer. If you choose, there was a possibility, although it is a face center, one will not choose an origin on the face center. But if you choose the origin on the face center and decide to go that way, then you will get the negative of this bar 1, bar 1, 2, that is also an acceptable answer. It is only sense is different.

So, if I am asking for a line of intersection, and I am not thinking whether this way, or this way, I am thinking of the whole line, then either of them is the right answer. But if I am thinking of a flow of electric current, so see if I am thinking of a stress, tensile stress, or tensile stress as a line, but it does not have a sense, tensile stress is not acting to my right. If you are putting tensile, do not try to do that.

But if somebody is pulling my right hand that way and my left hand this way, I am under tension I will definitely be under tension. So, but you cannot say that the tension is on the right or tension is on the left, but you can say that the tension is on this axis, it is not on this axis or it is not on vertical. So, it has a unique line, but the vector sense is not defined. So, 1 1 2 bar or bar 1 bar 1 2, both are fine.

But if I say electric current is flowing, then you have to decide whether it is flowing in 1 1 2 bar direction or bar 1, bar 1, 2, direction. So, depending on context, sometimes we might differentiate, sometimes we may think it is the same. So, thank you very much.